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MATERIA MEDICA AND THERAPEUTICS.

A MANUAL FOR STUDENTS AND PRACTITIONERS.

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PREFACE.

THIS compend is based upon the works of such acknowledged authorities as Brunton, Bartholow, Wood, Bruce, Edes, and Biddle, and upon the compiler's own notes of the didactic lectures of Professor Peabody of New York. It has been the endeavor of the writer to consider particularly those drugs which have recently recommended themselves to the notice of therapeutists.

Intended, as it is, for the use of students, the aim has been to omit all elaborate discussion, and to state concisely and completely the bare essentials as far as it is possible to glean them from a mass of more or less conflicting authority. It is hoped that, like its companion works of this series, it may be of use to the student, and at times to the practitioner, as a convenient and concise statement of the most important facts of Materia Medica and Therapeutics.

44 W. 24TH ST.,
NEW YORK, July, 1892.

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MATERIA MEDICA AND THERAPEUTICS.

How may Materia Medica be defined? Therapeutics?

Materia Medica is that branch of medical science which treats of medicinal remedies, their names, origin, chemical composition, physical peculiarities, methods of preparation, their mutual antagonism and synergism, and their physiological effects in medicinal and poisonous doses.

Therapeutics teaches of the uses of these remedies in the various morbid conditions of the human economy.

How may medicinal remedies be classified?

Remedies of this kind may be divided into—

Hygienic, which are treated of exhaustively in works on this subject;

Mechanical, such as venesection, cupping, aspiration, infusion, transfusion, etc., which fall more appropriately within the realm of minor surgery;

Imponderable, as air, light, heat, cold, and electricity, of which only heat and cold will here demand attention;

Pharmacological, or *drugs* properly so called, to which, strictly speaking, our field is limited: in this sense Pharmacology is synonymous with Materia Medica.

Pharmacy treats of the *art* of collecting, preparing, and dispensing medicines.

IMPONDERABLE REMEDIES.

What are the physiological and therapeutic uses of light?

The effects of heat and light are hard to dissociate. Light is a stimulant to all vital functions, and its use is indicated whenever there is imperfect nutrition from any cause.

HEAT.

What are the uses of heat and methods of application?

Like light, heat is a vital stimulus, a necessity to all organic life. Although the normal temperature of the body is remarkably uniform (about 98.4°), yet, as is well known, man is capable of exposure to great variations of heat and cold without harmful effect. We are not surprised, then, to find that most of the physiological effects of heat upon which depend its uses are of a *local* nature, not systemic. It is used

as an *excitant*, *evulsive*, and *analgesic* over small areas in the hot-water bottle, poultice, etc., and over large areas to produce vicarious eliminative action of the skin (diaphoresis) in certain conditions of imperfect kidney elimination and in certain cutaneous affections. For this latter purpose a more general application is obtained by hot baths—hot-air or "Turkish" baths and hot-vapor or "Russian" baths. Dry heat is a most valuable resource in combating surgical shock. The Turkish bath consists in exposing the subject to a gradual increase of temperature from 95° to about 155°: an immensely increased activity of cutaneous circulation results, and consequently a corresponding diminution of that of internal organs. These baths are a valuable remedy in the conditions mentioned above, but may prove dangerous if the patient be the victim of extensive cardiac or arterial disorder.

What are the uses of greater degrees of heat?

Heat is also employed to the extent of actual tissue-destruction in *vesication* and *cauterization*. The thermo- and galvano-cauteries are exceedingly valuable as counter-irritant, revulsive, and hæmostatic measures.

What are the two thermometric scales in ordinary use? and how are they compared?

The Fahrenheit scale is in ordinary use in America and England; the Centigrade is used on the Continent of Europe.

To Convert Degrees of the Centigrade Scale into those of Fahrenheit: Multiply the number of the former by 9 and divide by 5; if the temperature was above the freezing-point (0°), add 32°; if it was below the freezing-point, subtract the result from 32°, algebraically.

To Convert Degrees of the Fahrenheit Scale into those of Centigrade: If the temperature be above the freezing-point (32°), subtract 32; if it be below the freezing-point, subtract the number from 32, algebraically; then multiply the remainder by 5 and divide by 9.

What are the effects and uses of cold?

The effects of cold are *primary* and *secondary*. For the *primary effects* a considerable degree is required. It is efficient by lessening vascular and nervous excitement, constringing the tissues, lessening the actual volume of parts, and producing local anæsthesia. It is used in *nervous disorders*, as *meningitis*, *chorea*, *epilepsy*, *hysteria*, etc., generally as an application to head or spine—to *abate inflammatory processes* and *check hemorrhage* in a variety of conditions.

The *secondary* effects of cold are obtained by a lesser degree, but applied over a larger area, generally nearly the whole body surface, as in the cold bath, wet pack, etc. They are useful as a *general tonic* in debilitated conditions; as a respiratory stimulant in the narcotic poisoning of opium, chloral, alcohol, chloroform, and ether; as *antipyretic* in the hyperpyrexia of insolation (sunstroke), rheumatism, typhoid and other continued fevers.

What is the theory of action of hot and cold applications to the spine?

It is supposed that *heat causes stimulation*, and *cold, paresis*, of the vaso-constrictor nerves of the parts of the body deriving their vaso-motor supply from the section of the spinal cord over which the application is made (Chapman).

Electricity will receive treatment in the treatise on *Practice* in this series.

PHARMACOLOGICAL REMEDIES.

What is the modus operandi of drugs?

Drugs may act (1) *locally*, usually from some direct chemical effect on tissues; (2) *constitutionally* (systemically or remotely), for which it is necessary that they should be absorbed by the capillaries and lymphatics into the blood, often undergoing chemical changes in the process. The process of absorption is generally proved by finding traces of drug-elements in the blood, tissues, and secretions, and also by the fact that if circulation be interrupted the influence of drugs is not transmitted.

What circumstances modify the activity of drugs?

Diversity of action may depend *on the drug itself* as modified by season, climate, etc.; on the pharmaceutical preparation used: as the solubilities of the active principles of the same drug may vary, it is evident that their activity will vary with the solvent used (vide *Digitalis*, its tincture and infusion); again, liquid preparations are more potent than solid; *on chemical* or *physiological antagonism* or *synergism* of drugs taken at or about the same time; on *age* and *sex* of *patient:* females require proportionately smaller doses, unless we except cathartics; infancy and old age bear drugs poorly: however, there are certain drugs, notably belladonna, arsenic, quinine, aconite, and cathartics generally, which are borne by children in proportionately larger doses. *Young's rule* for graduating the dosage for children may be expressed thus: $\frac{\text{age}}{\text{age} + 12}$. *Cowling's rule* is to divide the age at next succeeding birthday by twenty-four.

On idiosyncrasy of patient: some individuals are peculiarly susceptible or the opposite to certain drugs. Thus the writer has seen on repeated occasions in the same subject two grains of quinine followed in a short time by a severe attack of spasmodic asthma, accompanied by a very pronounced and distressing urticaria.

On habit: certain forms of disease, time of administration as regards meals, and the condition of the stomach may all modify effects.

By what avenues may drugs be administered?

(1) By the skin:

(*a*) *Epidermatic*—application to skin without friction: absorption is

more rapid if chloroform be used as solvent. It is not much used because of interference offered by the epidermis and secretions of the skin.

(*b*) *Epidermatic—with friction:* systemic effects may be produced, as is especially well seen in the inunction of the ointment and oleate of mercury or of cod-liver oil in marasmic conditions.

(*c*) *Endermatic*—application of drug to a surface denuded of its epidermis by vesication: painful, and practically obsolete.

(2) By the mucous membranes:

(*a*) *Of gastro-intestinal tract*, the most usual method: perfect conditions for absorption are afforded either in the *acid* secretion of the stomach or the *alkaline* of the small intestine. Also by *rectal enemata:* when absorption is desired, about ℥iv of fluid should be injected: dosage by rectum is roughly about double that by mouth, or in narcotic drugs somewhat less than this. Medicinal and nutritive enemata are very valuable in cases of continued vomiting from any cause, inability to swallow, or in *forced* feeding and stimulation. Enemata of defibrinated beef-blood have proved most satisfactory in *pernicious anæmia.*

(*b*) Absorption may also take place through the mucous membranes of the conjunctiva, nose, throat, bronchi, and genito-urinary tract.

(3) By the subcutaneous areolar tissue, principally by the hypodermic method: usual sites of injection are the arm, thigh, and abdomen, and perfect asepsis is required to prevent infection. Under this subdivision may also be placed transfusion of blood and infusion of blood, milk, saline solutions, etc.

What are the recognized forms in which drugs are administered?

Preparations may be solid, semi-solid, or liquid.

The **solid** *preparations* are as follows:

Abstracta (abstracts), alcoholic extracts diluted with lactose (milk-sugar), and representing twice the strength of parent drug and ten times that of tincture.

Pulveres (powders), drugs in finely divided state, and rendered so by pulverization, precipitation, or elutriation; they are a suitable form for administration of drugs of pleasant taste, slight bulk, and permanent in atmosphere.

Extracta (extracts).—Extracts are obtained by evaporating *liquid* preparations, as tinctures, infusions, or vinegars, to a solid or semi-solid consistency. Extracts of fresh drugs may be *alcoholic, acetic,* or *aqueous.*

Triturationes (triturations) are more finely divided than powders: strength, 10 per cent. in milk-sugar.

Pilulæ (pills) are small globular masses suitable for the exhibition of drugs which are insoluble in the ordinary solvents or offensive to taste, but not bulky.

Trochisci (troches, lozenges, tablets, or pastilles); *confectiones* (confections); and *chartæ* (papers) complete the list of solid preparations.

The **liquid** *preparations are—*

Liquores (solutions), made by dissolving *non-volatile* principles in *water*.

Aquæ (waters), solutions of *volatile* principles in water.

Misturæ (mixtures), which are *insoluble* substances suspended in water by some viscid substance, as gum arabic, tragacanth, or sugar.

Tincturæ (tinctures), or solutions of recognized drugs in *alcohol, ethereal spirit*, or *aromatic spirit of ammonia*, and known accordingly as *alcoholic, ethereal*, or *ammoniated* tincture. As these menstrua evaporate readily, tinctures should be kept tightly corked or they may become seriously increased in strength.

Infusa (infusions).—In these the virtue of the drug is extracted by *digestion* or *maceration* in *cold* or *hot* (but not boiling) water: cold water is used when the active principles are affected by heat or are volatile. When boiling water is used, we have a decoction (decoctum).

Spiritus (spirits) are *alcoholic solutions* of *volatile* substances, bearing much the same relations to tinctures that aquæ do to liquores.

Vina (wines) are solutions in stronger white wine.

Aceta (vinegars), solutions in dilute acetic acid.

In *Mellita* (honeys) drugs are held suspended or dissolved in honey.

Syrupi (syrups) are preparations of medicinal substances in concentrated solutions of sugar. *Syrupus simplex* is 65 parts sugar with water to 100 parts, heated. *Compound syrups* contain other agents in addition.

Extracta Fluida (fluid extracts).—These are very convenient preparations, produced by *partial* evaporations of *solutions* of *active principles* in *alcohol* or *glycerin*. One minim represents one grain of drug (1 cc. = 1 gm.).

Oleoresinæ (oleoresins) are extracts of *crude* drugs by ether, made up of *fixed or volatile oils holding resins in solution:* they are liquids and self-preserving.

Glycerites, Elixirs, Mucilages, and *Collodions* complete the list.

The **semi-solids** are—

Suppositoria (suppositories), mixtures of medicinal agents in cacao butter, melting at the body temperature in rectum, vagina, uterus, or urethra.

Unguenta (ointments), which are preparations of agents for local use in some fatty substance, generally benzoinated lard, or in petrolatum.

Oleata (oleates) are *combinations* of *metallic bases* or alkaloids with *oleic acid*.

Cerata (cerates).—In these enough white wax or spermaceti is added to render them still solid at the body temperature.

Linimenta (liniments) are thick, oily preparations, *always liquid at body heat*, and intended to be *applied with friction*.

Emplastra (plasters) are *adhesive* at body heat; made in different ways, but most often with lead plaster, a compound of olive oil and litharge.

WEIGHTS AND MEASURES.

What two systems are used? What are their terms, symbols, and relative values?

In the United States, Troy or Apothecaries' Weight is still the standard, although the metric system is gradually coming into vogue.

Troy, or Apothecaries', Weight.

20 grains (gr.)	= 1 scruple (℈)	= 20 grains.
3 scruples	= 1 drachm (ʒ)	= 60 "
8 drachms	= 1 ounce (℥)	= 480 "
12 ounces	= 1 pound (℔)	= 5760 "

Wine, or Apothecaries', Measure.

60 minims (♏)	= 1 fluidrachm.
8 fluidrachms (fl. dr.)	= 1 fluidounce.
16 fluidounces (fl. oz.)	= 1 pint.
2 pints (O)	= 1 quart.
4 quarts	= 1 gallon (Cong., C) = 231 cubic inches.

There are 12 ounces in the Troy pound, but it is seldom used in prescribing. The scruple (℈) is very infrequently seen.

The metric system possesses the advantage of a single unit for solids and liquids, and a decimal system of multiplication and subdivision, thus giving it simplicity. Its unit, the gram (*gm.*), is the weight of 1 cc. of *distilled* water at 4° C. The subdivisions are milligram, centigram, and decigram, or respectively $\frac{1}{1000}$, $\frac{1}{100}$, and $\frac{1}{10}$ gram: its multiplications, decagram, hectogram, kilogram, etc., or 10, 100, and 1000 grams. The amounts required of liquid substances to equal a *gm.* vary of course with the sp. gr. of the liquid; *aquæ* are naturally practically gm. for cc.: in spirits, tinctures, and oils the difference is so slight as to be disregarded: æther fortior being of low sp. gr., one-fourth less is ordered; glycerin one-fourth more; syrup one-third and chloroform one-half more.

What are the comparative equivalents of Troy and metric weights?

A *gram* is practically equivalent to 15 grains: ʒj therefore = gm. 4.; fʒj = 31 cc. or gm. Bearing these few points in mind, the transposition from one system to the other is easy. Thus, reduce the quantity to grains and *divide* by 15, the quotient representing, approximately, the quantity in grams. Or reduce to drachms and *multiply* by 4. The terms decagram, hectogram, and kilogram are seldom used in prescribing, their equivalent being expressed in gm.; thus gm. 10, gm. 100, etc.: for subdivision, gm. .1, gm. .01, and gm. .001.

Drops (guttæ, *gtt.*) are loosely used as equal to minims, but vary with a number of conditions: of *tinctures*, for the most part, a fluidrachm *contains* about 120 drops, or *2 drops to the minim*, while an equal

amount of chloroform contains over 200. In prescribing less powerful liquids a *teaspoonful* is roughly used as equalling ℥j, but it is safer to consider *six teaspoonsful to the* ℥j; a tablespoonful for ℥ss; a wineglassful for ℥ij; a teacupful for ℥iv.

CLASSIFICATION OF DRUGS.

Some classification of medicinal agents seems necessary, but, owing to the great variety of effects and uses of certain individual remedies, no satisfactory arrangement is possible. Various groups, as antispasmodics, anæsthetics, somnifacients, delirifacients, cardiac stimulants and depressants, etc., to be later defined, are recognized. Our purpose will be to treat of each drug in that class in which it finds its chief efficiency, and to mention it in its other less important therapeutical asssociations.

ANTISPASMODICS.

What are antispasmodics?

A class of drugs whose physiological effects are not pronounced, acting in some unexplained manner on the cerebrum, and especially valuable in neurotic conditions, as hysteria, "nervousness," etc. They are all stimulant and diaphoretic, and most of them have a strong, peculiar odor.

CAMPHOR.

What are the origin and physical peculiarities of camphor?

Camphor is a stearopten, derived by sublimation from the *roots* and *branches* of *Camphora cinnamomum*, or camphor laurel, an Asiatic tree. It occurs in soft, rather consistent pieces, of hot and peculiar taste and cooling after-taste, and of characteristic odor. It is *volatile*, burns with a very smoky flame, floats on water, in which it is quite insoluble and by which it is precipitated from its solutions in alcohol, ether, chloroform, and oils. Chemically, it resembles the turpentines, and it forms substitution products with the chlorine group.

What are the preparations of camphor, and their doses?

Camphora, dose gr. v to xv; best given in emulsion or pill.
Camphora Monobromata (see below), dose gr. v.
Aqua Camphoræ (1 : 125), dose ℥ss–ij.
Spiritus Camphoræ (1 : 10), dose ♏xx–xl.
Linimentum Camphoræ, 20 per cent., in olive oil,
Ceratum Camphoræ (3 : 100),
Linimentum Saponis,
} external use.

What are its physiological effects?

Camphor is much more active than other members of this group. Locally, it is an *irritant* to skin and mucous membranes, producing superficial inflammation of the former, and, when swallowed, symptoms

of irritant poisoning: it is mildly diaphoretic, stimulant to circulation in medicinal, and depressing in larger, doses. Nervous system—small doses exhilarate, larger cause headache, dizziness, delirium, convulsions, while toxic doses produce convulsions, stupor, and coma. Upon the genito-urinary tract large doses exert a *decided sedative effect.*

Name its most important therapeutic uses.

In *hysteria*, *melancholia*, *nervous headache*, and *dysmenorrhœa* as a sedative; in *typhoid* and *adynamic fevers* as a stimulant diaphoretic; in *diarrhœa*, *dysentery*, *cholera*, etc., generally combined with opium; in *chronic bronchitis* and *emphysema*, acting as a blennorrhetic and antispasmodic; to allay irritation of genito-urinary tract, as in *priapism*, *chordee*, *nymphomania*, *dysmenorrhœa*, etc., large doses necessary; *acute coryza* in its incipiency may be aborted by camphor.

Its external applications are valuable mild counter-irritants.

SPIRITUS ÆTHERIS COMPOSITUS (HOFFMAN'S ANODYNE).

What are its component parts and efficient ingredients?

Hoffman's anodyne is composed of *oleum æthereum*, 3 per cent.; ether, 30 per cent. in alcohol. It owes its activity to the first two. *Oleum æthereum*, or heavy oil of wine, is obtained by distilling alcohol in an excess of sulphuric acid, and adding an equal amount of ether to the distillate: it is antispasmodic, but is only used in the above preparation. *Hoffman's anodyne* is a colorless, volatile, inflammable liquid, of ethereal odor and burning but sweetish taste, and giving when mixed with water a milky color, which is a test for its purity. The color is due to the precipitation of the oil of wine, which is expensive and often wanting in sophisticated preparations.

Effects and uses of Hoffmann's anodyne.

It is an efficient antispasmodic in the distressing attacks of cardiac disease, having slight stimulating effects; also in asthma, hysteria, etc.; also employed as a carminative and anodyne.

VALERIAN.

Give its origin and composition.

Valerian is the *rhizome* and *rootlets* of *Valeriana officinalis*, which contains a volatile oil, *oleum valerianæ*, of peculiar odor and yielding *valerianic acid*, *valerian camphor*, and *resin.*

What are its preparations?

The number of officinal preparations is out of proportion to its usefulness. The principal are—

Tinctura Valerianas (1 : 5), dose ʒss-iv.

Tinctura Valer. Ammoniata (1 : 5), dose ʒss-iv.

Ammonii Valerianas, dose gr. ij–viij.
Zinci Valerianas, dose gr. j–iij; a *zinc* salt.
The oil, abstract, and fluid extract of valerian, and the valerianates of iron and quinine, complete the list.

What are its physiological effects and therapeutic uses?

Valerian is not constant in its action, at times exciting and at others allaying reflex excitability—a variability which may be due to the numerous phases of the condition in which it is most employed. Large doses may cause epigastric burning and symptoms of gastric irritation, with headache, vertigo, mental exhilaration, and hallucinations, but these are not invariable. It probably stimulates slightly the circulation. Its chief value has been found in *hysterical conditions generally*, in which it is frequently used; also used with varying success as an antispasmodic in pertussis, asthma, chorea, and spasmodic conditions generally; but will prove most efficient in those of neurotic origin, as *laryngismus stridulus*. The valerianate of ammonia has met with success in neuralgias, nervous headache, and hysteria.

ASAFŒTIDA.

What are its origin and composition?

Asafœtida is a *gum-resin* obtained from the exudation following incisions into the living root of *Ferula narthex* and *F. scorodosma*. Besides gum and resin it contains a *volatile oil*, which gives the drug its peculiar garlicky odor.

What are the preparations and doses of asafœtida?

Asafœtida, gum-resin, dose gr. v–xv.
Pilulæ Asafœtidæ (in each gr. iij), No. ij–iv.
Mistura Asafœtidæ (milk of asafœtida), dose ℥ss–j.
Mistura Magnesiæ et Asafœtidæ (Dewees' carminative) contains 7 per cent. of tinct. asafœtidæ and 1 per cent. tinct. opii; dose ♏xx.
Tinctura Asafœtidæ (1 : 5), dose ℥ss–j.
A pill of aloes and asafœtida and a plaster are officinal.

Has it any marked physiological effects?

Its effects are disputed. It is probably mildly stimulant and carminative; it increases the secretions of the bronchi and intestines, and gives rise to very offensive stools; by some it is claimed to stimulate peristalsis.

What are its therapeutic uses?

Like valerian, it is of use in hysterical conditions. But from its supposed expectorant and intestinal effects it is said to have peculiar efficiency in spasmodic pectoral affections, in flatulence and tympanites: these conditions in children may be relieved by enemata of lac asafœtidæ, but the odor renders the remedy very objectionable.

MOSCHUS (MUSK).

What is musk?

Musk is the dried secretion from the *preputial follicles* of *Moschus moschiferus*, or musk-deer: seldom found in shops, and is apt to be greatly sophisticated.

What are its preparations?

Moschus, dose gr. v–xv.
Tinctura Moschi, dose ʒss–ij.

What are its physiological effects and its uses?

On the healthy organism its effects are probably *nil*. In certain adynamic and nervous conditions it may prove exhilarant, stimulant, and antispasmodic. It has its advocates in conditions of collapse and the adynamic stages of typhoid and alcoholic pneumonias, and may prove valuable in *hysterical manifestations*, *singultus*, and other spasmodic conditions.

SUCCINUM (AMBER).

Oleum succini (oil of amber) is a *volatile oil* obtained by destructive distillation from amber, which in turn is a *fossil resin* of an extinct coniferous tree (*Pinitis succinifer*) found along the Baltic shores.

What are its effects and uses as an irritant and antispasmodic?

Locally, it is irritant, and has been used in rheumatism and as an embrocation in whooping cough. Internally, it is a reputed antispasmodic. Dose gr. v to xv in capsule: larger doses may cause gastric irritation.

HUMULUS (HOPS).

What are its origin and composition?

Humulus is the strobiles (cones) of the *Humulus lupulus*, or hop-vine, having at the bases of their imbricated leaves a yellowish powder, officinally known as *lupulinum*, and containing among other things a bitter principle and a volatile oil.

What are its physiological effects? Has it practical utility?

Like other bitters, it is a stomachic tonic, and may be used as such: hops may produce diaphoresis, and they exert a slightly sedative effect on the cerebrum: they are slight cardiac excitants. Humulus has been recommended in combination with tinct. capsici as a substitute for alcohol. It exerts a somewhat sedative effect on the genito-urinary tract, and is used in abnormal sexual excitement and vesical irritability, meeting with the most success in functional conditions. It is a domestic remedy and has a number of useless preparations. Dose of the tincture, ʒj–iij; of fluid extract, ♏x–xv; of the oleoresin, gr. ij–v. *Lactucarium*, the concrete juice of *Lactuca sativa* (garden lettuce), has an officinal fluid extract, but is probably inert.

ANÆSTHETICS.

Define "anæsthetic."

The term "anæsthetic," which from its derivation (*a*, non, and *αισθησις*, sensation) would apply to any pain-allaying measure, has been limited to certain æthereal substances administered by inhalation and producing unconsciousness, accompanied by loss or diminution of sensation, motion, and reflex action. The manner in which they accomplish this is still under discussion, and will not engage our attention. Those most commonly employed are ether and chloroform.

ÆTHER (ETHER).

What are æther, its chemistry, and its preparation?

Ether is ethyl oxide $(C_2H_5)_2O$, and is formed by the dehydration of ethyl alcohol by sulphuric acid (hence called *sulphuric ether*), and subsequent purification by calcium chloride, by which the alcohol and acid impurities are removed.

Æther.—The officinal ether contains 74 per cent. of ethyl oxide and 26 per cent. of alcohol. It is chiefly used as a solvent for oils, resins, gutta-percha, etc., although it produces essentially the same effects as—

Æther Fortior, 94 per cent. ethyl oxide, a thin volatile liquid of pungent odor, soluble in 8 parts of water, and easily in all ordinary solvents (alcohol and chloroform in all proportions). It is inflammable, explodes forcibly when ignited, and boils at about the body-temperature (98.6° F.). Its sp. gr. is about 0.725, but its vapor *sinks*, being heavier than the atmosphere; hence artificial lights should be placed *above* it.

What are the physiological effects of ether inhalations?

Two stages are recognized. The first, or so-called *stage of excitement*, is characterized by a choking sensation, coughing, and other symptoms of irritation of the respiratory tract; then succeed mental excitement, lightness of the head, buzzing in the ears, and a variety of emotional disturbances (laughing, weeping, shouting, fighting, etc.); the patient can still be somewhat aroused. At the end of the first stage a tetanic condition occurs, with cyanosis and great muscular rigidity. The second stage begins with complete unconsciousness, upon which loss of susceptibility to pain quickly supervenes, with *abolition of reflexes* and, generally, *complete muscular relaxation* (although rigidity may last much longer, especially in alcoholic patients). The portions of the body retaining sensibility longest are the eyes and muco-cutaneous junctions. All nervous centres are suspended except the medulla, which continues to preside over the organic functions of respiration and circulation. If pushed, death results from *respiratory paralysis*, although of late claims have been made that *heart failure* may, in some cases at least, occur first. Early in anæsthesia there is cardiac and vaso-motor stimulation, hence the blood-pressure falls.

What effects has ether internally? locally?

It is antispasmodic and anodyne, with slight *primary stimulant* effect. Hypodermically, it is valuable in collapse as a cardiac stimulant. Locally applied, it evaporates quickly and causes coolness and slight anæsthesia of the parts.

What preparations contain ether?

Æther. See above.
Æther Fortior, used for anæsthesia; by mouth, dose ʒss–j.
Spiritus Ætheris (one-third æther and two-thirds alcohol), dose ʒj–iij.
Spiritus Ætheris Compositus (antispasmodic), dose ʒss–ij.
Spiritus Ætheris Nitrosi, dose ʒss–j.

The last is known as "sweet spirit of nitre," and is an alcoholic solution of ethyl nitrite, containing about 5 per cent. of ether (to be considered later).

CHLOROFORM.

What is chloroform? Its properties?

Chloroform is *methynyl chloride* or *terchloride of formyl* ($CHCl_3$). It is a colorless fluid of *neutral* reaction, hot and sweetish taste, and peculiar pleasant odor: it is less soluble in water than ether, freely soluble in other solvents, and is itself a very good solvent for fats, resins, some of the balsams, and many alkaloids. It is also called methylic ether.

What are the physiological effects of chloroform inhalation? How are they different from æther?

When inhaled the effects resemble those of ether, but are much more rapid and powerful, and marked by an absence of faucial irritation when given in the proper dilution with air (about 3½ per cent.). Complete anæsthesia takes place in from one-half to two minutes, while the average for ether is eight to ten minutes: there is less liability to unpleasant sequelæ, as vomiting, etc., and the patient regains consciousness earlier. The pupils dilate at first, then contract during profound narcosis, and a second dilatation warns that a danger-point has been reached.

Circulation.—Authorities agree that it is more depressing to the heart than ether, that the arterial tension is lower, and that death takes place generally from *cardiac paralysis*, but in rare instances from arrest of respiration: these unpleasant symptoms may occur with hardly any warning. Locally, undiluted, it is decidedly irritant, and vesicates when evaporation is prevented. By mouth its effects resemble those of ether closely—anodyne and antispasmodic.

What are the preparations of chloroform, and their uses?

Chloroformum Venale, commercial chloroform, not used in medicine *except* locally.

Chloroformum Purificatum, purified chloroform, should have a sp. gr. of at least 1.485; seldom used internally; is the form for inhalation.

Mistura Chloroformi (chloroform 8 per cent., camphor 2 per cent.), dose ʒss–j.

Spiritus Chloroformi (10 per cent.), dose ♏x–ʒj.

Linimentum Chloroformi (chloroform 40 per cent., soap liniment 60 per cent.).

What uses have ether and chloroform?

Anæsthesia by these agents is indicated in operative surgery, where they find their chief utility; during the second stage of labor, not to full anæsthesia, ether may be used, but chloroform seems safer here than in other conditions, and is probably preferable.

In *dislocations* and *fractures* they are valuable by overcoming muscular spasm both for diagnosis and reduction; in convulsions of all kinds; in the *diagnosis* of *hysteria* and *malingering* from actual disease.

Internally, they correspond closely, chloroform having the advantage of being more palatable. In their various preparations they are used in *gastralgia*, *colicky pains*, *dysmenorrhœa*, *hysteria*, and as vermifuges. Chloroform is said to abort malarial paroxysms, and its liniments are standard local remedies for chronic rheumatism and neuralgia.

When are ether and chloroform contraindicated?

In *cardiac disease*, either valvular without compensation, or when *structural* changes exist in walls; in *cerebral tumors* and *cerebral endarteritis* the primary congestion may produce hemorrhage; in *chronic alcoholism:* these patients bear anæsthesia badly; in *advanced pulmonary disease*, ether especially; in *nephritis*, ether may cause uræmia, and chloroform is to be preferred.

State some of the comparative advantages of each.

Ether, being undoubtedly less liable to cause death, is to be preferred *in all cases* except the following, in which chloroform is more available: in hot climates, ether *boiling* at less than 100°; in *military practice*, chloroform is less bulky and expensive; in *young children*, it is less apt to cause fright; in *diseases* of *stomach* and *kidneys*, less danger of nausea and uræmia; or when artificial light is needed or cautery about face.

Give some important details in producing anæsthesia.

The stomach should be empty; if ether, the patient should be warned of the unpleasant features and assured that all will be well; all foreign substances or loose teeth should be removed from the mouth; the patient should be put in the recumbent position, with head turned to one side, and all clothing liable to cause respiratory embarrassment loosed; the patient and his friends should always understand that there is *some* danger in the process.

What is to be done when toxic symptoms occur?

During Ether Anœsthesia.—When dangerous symptoms arise, suspend the anæsthetic, draw the tongue forward, give atropine or strychnine hypodermically, and if necessary artificial respiration and faradization of respiratory muscles should be employed.

During Chloroform Anœsthesia.—Stop its administration, and immediately *invert the patient*, head downward: ammonia, alcohol, digitalis, or strophanthus may be given hypodermically, or amyl nitrite by inhalation.

When either is taken internally in toxic amount, treat as a case of irritant poisoning.

NITROGEN MONOXIDE, OR LAUGHING GAS.

What is its preparation?

This non-officinal gas, so much used in dentistry, is prepared by heating ammonium nitrate, decomposing it into water and nitrogen monoxide.

What are the effects of laughing gas?

Inhaled, it produces in from one to three minutes anæsthesia, preceded by a period of excitement, with hilarious, pugnacious, or erotic sensations: its *modus operandi* is not known, but it is probably more than pure asphyxia. It may be used as an anæsthetic in brief minor surgical operations, being comparatively harmless.

What other anæsthetics can you mention?

Ethylene Bichloride: acts rapidly and powerfully; liable to cause sudden paralysis, but is safer than chloroform.

Methylene Bichloride: more disagreeable and probably more dangerous than chloroform.

Ethyl Bromide or **Hydrobromic Ether**: dangerous and uncertain.

LOCAL ANÆSTHESIA.

What were the older methods of producing local anæsthesia?

Slight local anæsthesia has been produced by the topical application of carbolic acid, chloroform, tincture of aconite, veratrine, certain volatile oils, as those of peppermint and bitter oil of almonds, and by dilute hydrocyanic acid. A method still somewhat in vogue is the production of cold by the rapid evaporation of volatile substances, as ether or rhigolene. These means, however, have been practically superseded by the advent of cocaine.

COCAINA, OR CUCAINA (COCAINE).

What is cocaine, and how does it act?

The alkaloid of *Erythroxylon coca* (cuca), containing a larger or smaller percentage of *hygrine*, an alkaloid of mydriatic powers. Cocaine, the

local effects only of which now concern us, acts *when in contact* with nerves of *sensation* or *special sense* as an anæsthetic. The skin forms a barrier against these effects, while it is readily efficient when applied to the conjunctival or nasal mucous membranes: *repeated* applications are necessary to render the mucous membranes of pharynx and vagina insensitive. The tissues are at first constringed from vaso-motor stimulation, but a reactionary congestion soon follows. Slight paresis of motor nerves may also be produced (Wood). The skin barrier is overcome by its hypodermic use: the cocaine solution (2 to 8 per cent.) should be injected just *into* the skin, and not deeply in the tissues: the hydrochlorate is the salt used and forms a watery solution. Greater efficiency is secured in the extremities by controlling the circulation with an elastic band (Corning's method). Otherwise it is partially carried away by the circulation. Laparotomy even may be performed under its use.

In what conditions is cocaine anæsthesia valuable?

In the minor surgical operations of ophthalmic, laryngological, gynecological, and general practice. Bony structures are with difficulty rendered insensitive, and ether is more suitable.

In *pruritus ani* and *pruritus vulvæ*, *anal fissure*, and other painful conditions its topical use affords great relief.

In *neuralgias* by injection into neighborhood of the affected nerve-trunk at any point proximal to seat of pain.

In *hay asthma* repeated applications are said to permanently contract the turgescent vessels, but some cases at least are not cured, although all are alleviated.

Gastralgia from gastritis or gastric ulcer, and *persistent vomiting*, may yield to its internal administration in doses of gr. $\frac{1}{8}$ to j of the hydrochlorate.

HYPNOTICS (SOMNIFACIENTS).

Into what two classes may these be divided?

This class of drugs, known also as narcotics, may be subdivided into those which have a pain-allaying effect (analgesics), of which opium is a notable example, standing in many respects alone, and the pure hypnotics, or sleep-producing agents, the number of which has recently been much augmented.

OPIUM.

What are its origin and chemistry?

Opium is the *concrete juice* obtained by incisions into the *unripe capsules* of *Papaver somniferum*, or opium poppy, containing *from 9 to 14 per cent. of morphine*, and other alkaloids in smaller proportions.

What are the physical properties of opium?

Good opium is of a fine chestnut color, dense consistency, and a strong

characteristic odor. It should break with a deeply-notched fracture, and when drawn across white paper should leave an interrupted stain. It has a bitter, acrid taste, and imparts its activity to water, alcohol, and diluted acids.

What are its preparations? Their strength and doses?

Opii Pulvis should contain from *12 to 16 per cent. of morphine;* used in making most of the opium preparations; dose gr. ss to ij.

Opium Denarcotizatum: deprived by ether of its narcotine; 14 per cent. morphine, thus less varying than the powder; dose gr. ss–ij.

Pilula Opii: each gr. j: hard opium pills may be borne better by an irritable stomach.

Extractum Opii: thrice the strength of opium; dose accordingly.

Emplastrum Opii; has very little utility.

Trochisci Glycyrrhizæ et Opii, each gr. $\frac{1}{20}$ of extract.

Pulvis Ipecacuanhæ et Opii (Dover's powder); opium and ipecac powders, of each gr. j of lactose to gr. x; dose gr. x.

Tinctura Opii (laudanum); 10 per cent. of powder: dose ♏x to xij (20 to 30 drops), equal to gr. j of opium; favorite for enemata, and now seldom used by mouth.

Tinctura Ipecacuanhæ et Opii; ♏x = opium gr. j.

Tinctura Opii Camphorata (paregoric); contains opium gr. ij to ℥j and a variety of other ingredients, including camphor in same amount; used for children; dose ℥ss *for adults*, proportionately smaller for children; forms 12 per cent. of mist. glycyrrhizæ comp.

Tinctura Opii Deodorata; narcotine and odorous principles removed by ether; strength and dosage same as laudanum.

Acetum Opii (black drop); also 10 per cent.; dose see *Laudanum.*

Vinum Opii (Sydenham's laudanum); 10 per cent. opium; dose ♏xij or gtt. xxv.

Mistura Magnesiæ et Asafœtidæ; contains 1 per cent. laudanum.

The alkaloids and their salts are—

Morphina, for pharmaceutical use principally.

Morphinæ Acetas,
Morphinæ Sulphas,
Morphinæ Hydrochloras, } dose gr. $\frac{1}{8}$ to gr. $\frac{1}{4}$.

Pulvis Morphinæ Compositus; contains of morph. sulphate 1 part, with 20 parts each of camphor, licorice, and calcium carbonate; known as *Tully's powder;* dose gr. x.

Trochisci Morphinæ et Ipecacuanhæ; morphine sulphate gr. $\frac{1}{10}$ and ipecac gr. $\frac{1}{12}$ in each.

Codeina, gr. ss to ij; about four times weaker than morphine; a favorite in cough medicines and diabetes.

Name some important unofficinal preparations.

Liquor Magendie ("Magendie's solution") is much in use for hypo-

dermic purposes; contains gr. xvj to aq. ℥j of morph. sulph.; dose ℥j = gr. ij, ℥ss = gr. j; an ordinary dose hypodermically is ♏vj to x.

Liquor Morphinæ Sulphatis (U. S. solution); dose gr. j : ℥j.

What are the physiological effects of opium?

The effects of opium vary decidedly with the size of the dose. *Small doses*, in persons unaccustomed to the drug, produce at first a sense of well-being, stimulation of the mental faculties, especially the imaginative (probably due to lessened restraint by blunting of the highest mental endowments, as judgment, etc.), followed by a blissful dreamy state, merging more or less quickly into a sleep which may be disturbed or restful, and from which the patient awakes either refreshed or with more or less headache, nausea, and depression. *Larger Doses.*—When large medicinal doses have been administered the period of stimulation is shorter, the sleep more profound, the pupils are somewhat contracted, sweating *may* ensue, and the symptoms of depression and gastric disturbance more marked. When *very large doses* have been taken the patient sinks almost at once into a profound sleep, with slow and noisy breathing, slow full pulse, and minutely contracted pupils, while the skin gets cool and becomes covered with clammy perspiration. After *fatal* doses stupor, coma, stertor, respiratory and circulatory depression occur, and finally death from paralysis of the respiratory centre.

What are its effects on different bodily functions?

The effects *seriatim*, and their explanations on physiological grounds as far as known, are as follows:

Nervous System.—A progressive paralysis, involving in succession the cerebral, sensory, and reflex functions, and finally the important centre in the medulla.

Circulation.—A *primary acceleration* of pulse-rate, followed by a slow full pulse and increased (?) arterial pressure: these effects are due to stimulation of inhibition and of the cardiac muscle. After toxic doses a rapid and feeble pulse from paralysis of the same.

Respiration.—Opium *slows* respiration by a *centric* effect; in poisoning the respirations may be as infrequent as one a minute or even less.

Pupils.—Generally equally contracted, and after large doses very much so—a centric effect, as it does not occur when instilled into the eye. *All secretions* except perspiration are decreased; the urinary *solids* may be increased or decreased, but the *fluids* are always diminished; retention of urine may occur.

Digestion.—Secretions and peristalsis diminished; as a direct consequence, digestive impairment, with anorexia, nausea, and constipation, results.

What are the chemical and physical properties of morphine?

This *alkaloid*, representing practically the medicinal and for the most part the physiological powers of opium, occurs in colorless crystals, odor-

less, but of very bitter taste. Owing to its own insolubility, its salts, the sulphate, hydrochlorate, and acetate, are most frequently used: to obtain the same effects from these about one-fourth more should be given than of morphine. Morphine should average 14 per cent. in good opium (12 to 16 per cent); hence gr. ½ about equals gr. 1.

How does morphine differ from opium?

Morphine differs from opium in being *less apt to derange digestion*, *less constipating*, *less diaphoretic*, and *less tetanizing*, while it is more apt to cause pruritus, is more hypnotic and analgesic, and probably more of a cardiac stimulant; retention of urine is less apt to occur under its use.

What may be said of codeina?

Codeine is present in small amount (0.03 per cent.). The physiological powers of this alkaloid are not clearly understood; it probably, as used, has varied in composition, which alone would explain the conflicting reports upon its effects.

What other alkaloids are contained in opium?

Besides morphine and codeine, opium contains a number of other alkaloids, the most important of which are—

Thebaine or paramorphine,
Laudanine,
Porphyroxine,
} tetanizing agents.

Narcotine, to which some attribute the unpleasant gastric effects.

Narceine, papaverine, meconine, cryptopine, and hydrocotanine have been somewhat investigated.

Opium also contains various acids (meconic, theobolactic, and sulphuric), gum, extractive, and a volatile odorous principle, the last of which shares with narcotine the reputation of being the nauseant principle.

Treatment of acute opium-poisoning.

Very small doses have proved fatal in children, and gr. ½ of morphine is said to have caused death in a feeble adult. When toxic symptoms develop after a moderate dose, or when a presumably toxic dose has been taken—

Empty the stomach at once, preferably with the stomach-pump or gastric siphon—the latter may be improvised from a rubber tube and funnel—or emetics may be given: *mustard*, being generally available, may be given in ℥ss dose and repeated in ten or fifteen minutes, or the *sulphates of copper or zinc* in large doses.

Next give chemical and physiological antidotes to neutralize the remainder—*tannic acid*, *strychnine*, or *atropine;* the last should be administered *tentatively in small doses*, guided by its physiological effects, *especially on respiration*.

Remainder of treatment consists in *various measures to maintain respiration*, such as walking patient about, flagellation, hot and cold affu-

sions, faradism, and, if necessary, artificial or forced respiration and oxygen inhalation; strong coffee is valuable, given by mouth or rectum.

Give some symptoms and cures of chronic opium-poisoning or habit.

Toleration of the drug may be greatly increased and incredible amounts consumed. The digestive and nervous systems are most affected; the subject loses mental and moral tone; if rapidly increasing amounts be taken, great deterioration of the general health may ensue.

Treatment of the habit is very often only temporarily effectual: the drug may be withdrawn immediately or "tapered off." Much depends on careful attention, nursing, feeding, and moral support. The simple hypnotics may be given and stimulating nutritious food; beware of "opium cures," which generally contain morphine; no drug takes its place. On withdrawing the drug a diarrhœa may be set up and require very careful treatment. Prophylaxis is all-important.

What are the therapeutic indications for opium or morphine?

This drug is indicated and is a most valuable remedy in *pain* of all descriptions, as the various neuralgias and colics—a most potent analgesic; as an *antispasmodic* in certain conditions, notably *spasmodic asthma*, which may frequently be aborted by its hypodermic use; also in *spasm* of *glottis* and *lead colic;* in *diarrhœa* and *dysentery* opium combined with astringents is the most available treatment.

In *peritonitis* comparatively large doses are given, acting by allaying pain, decreasing peristalsis, and, in early sthenic stages, by some direct antagonism to the inflammatory process itself (antiphlogistic).

In *cholera morbus*, invaluable hypodermically.

In beginning inflammation of pleura and lungs and in *acute coryza* it seems to lessen activity of process.

In *hemorrhages* and in the distressing *paroxysms* of *valvular disease*, morphine subcutaneously.

In *true diabetes*, codeine preferably; also in diabetes insipidus; in *uræmia*, hypodermically and with care; in acute diseases, as the exanthemata; in distressing *cough*.

Its use is warranted in the last stages of chronic disease and in small amounts in old age; as hypnotic only in very rare cases.

How is it administered? and with what cautions?

Opium may be administered by mouth, by rectum, or subcutaneously as the conditions demand. It should never be given as hypnotic when simpler measures are adequate, is *contraindicated* in coma of any kind, and *caution* should be exercised in using it in cerebral conditions, uræmia, respiratory embarrassment, delirium tremens, or when possibility of hernial strangulation exists. Never follow a dose of opium or its synergists by another dose subcutaneously, for the two may take effect at the same time. Remember that children bear opium badly, and that certain adults have an idiosyncrasy.

CANNABIS INDICA AND CANNABIS AMERICANA.

What are these drugs? Hypnotic + analgesic —

Indian and American hemp, the *flowering tops of Cannabis sativa* as grown in India and America, the former being the more active and the recognized source of the officinal preparations. It is used in India as a narcotic stimulant under the various names of haschisch, bhang, churrus, and gunjah.

What are the officinal preparations of cannabis?

Extractum Cannabis Indicæ; most used; dose gr. ¼–j.
Extractum Cannabis Indicæ Fluidum, dose ♏j–x+.
Tinctura Cannabis Indicæ (20 per cent.), dose ʒss.

Describe its physiological action.

There are two stages: (1) characterized by mental exhilaration, followed by (2) drowsiness and sleep. After a dose varying with efficiency of drug and the temperament and surroundings of the patient a condition of peculiar agreeable mental exhilaration is felt; the ideas flow quickly, and sense of duration of time and extent of space is lost. There are greater or less cutaneous anæsthesia, a sensation of weight in limbs, and some muscular incoördination from loss of muscular sense. Hallucinations and mild delirium may occur. Then succeed drowsiness and sleep, from which patient awakens with some depression. Cannabis differs from opium in not affecting respiration, in that it *dilates the pupils*, and in not lessening the secretions. The circulation is not affected. No fatal cases are recorded.

To what does it owe its activity? What is its administration?

A volatile oil and a resin, *cannabin*. The extract is most commonly used, but is of very uncertain strength, and it is soluble in alcohol and ether, but not so in water.

In what conditions may cannabis be used?

Its uses are fewer than formerly. It has been used in *tetanus*, *chorea*, and *hysteria* as an antispasmodic; in *neuralgias*, *muscular rheumatism*, and *migraine* as an analgesic.

As an hypnotic it has been used, but is of uncertain strength and not now in favor, while as an anæsthetic it is useless. *Tannate of cannabin* is also an uncertain hypnotic.

CHLORAL (CHLORAL HYDRATE).

What chemical features has chloral?

Chloral is a thin, oily, colorless *liquid*, prepared by leading chlorine gas through anhydrous alcohol, the results being chloral and hydrochloric acid, which separate in layers, the lowermost of which is chloral. It is purified by distillation with sulphuric acid and quicklime. Chloral is not itself used in medicine.

What is chloral hydrate?

Chloral hydrate is not a true hydrate, but a combination of a chloral element with an entire molecule of water. It is a colorless, crystalline, deliquescent salt of disagreeable taste, more stable than chloral, and freely soluble in water, alcohol, or ether.

What are its physiological effects?

Locally, chloral is an irritant, and occasionally causes gastro-intestinal irritation. In *medicinal doses* of gr. xv–xx the principal effect of chloral hydrate is a quiet, natural, and refreshing sleep. *Larger doses* cause profound sleep, diminution of reflexes, depression of respiration, depression of cardiac force and capillary dilatation, slightly contracted pupil, muscular weakness, and perhaps a certain degree of anæsthesia. *Toxic doses* are followed by coma, and cause death by stoppage of respiration, circulation, or both simultaneously. The supposed transformation into chloroform by the alkaline blood probably does not occur. In large doses it lowers the bodily temperature decidedly.

not analgesic

What are its uses?

The chief uses of chloral hydrate, medicinally, are hypnotic and antispasmodic. It is used as an *hypnotic* in sleeplessness not dependent on pain, as in insomnia from overwork or hysteria, acute mania or delirium tremens, succeeding the better the more purely nervous the cause. It is used as an antispasmodic in *puerperal*, *uræmic*, *infantile*, or *strychnine convulsions*, in all of which, administered by rectum or mouth, it is very efficient in palliating until other curative measures can be tried; in *tetanus*—large percentage of cures reported by some, while with others it has failed; *trismus neonatorum* also; *whooping cough* and *choreic spasm* are alleviated; *sea-sickness* and the *vomiting of pregnancy* and other *neurotic vomiting* may be checked by chloral combined with recumbent position and proper diet; in conditions of high arterial tension it affords relief.

Chloral hydrate is used by some obstetricians to relax a rigid cervix uteri and to relieve the pains of labor. This is the only condition in which it is analgesic in safe doses. It is a good antifermentative, and as such it is used to prevent decomposition of urine; added to liq. Magend. in small percentage it renders it more stable.

What two forms may chloral-poisoning take?

Acute and chronic.

Acute Poisoning.—The principal symptoms are profound depression of respiration and circulation, stupor and coma, suffusion of conjunctivæ, and muscular weakness as shown by the dropping of lower jaw. *Treat as for opium-poisoning*, avoiding, however, anything (as forced exercise) which causes muscular exertion on the patient's part, and watching the heart's action closely. Dry heat is a valuable measure.

Chronic Poisoning.—The continued abuse of chloral hydrate may

cause mental weakness, dementia, and in some cases paralysis or paresis; respiratory disturbance, as pronounced dyspnœa; cutaneous eruptions, probably from continued dilatation of the superficial capillaries, taking the form of *erythema* or *urticaria* (especially after chloral and alcohol), catarrhal pharyngitis, and many other rarer effects.

What is the administration of chloral hydrate?

Dose gr. x to xx, the latter being as large as is consistent with safety, to be given in some agreeable syrup. Rectal administration may prove convenient or necessary in conditions; it is readily absorbed and dose is is the same as by mouth. *Alkalies* are *incompatible*, forming chloroform. Caution is necessary when any cardiac lesion exists.

What is croton chloral?

A crystalline substance freely soluble in water, and possessing effects similar to, but weaker than, chloral hydrate, with the added power of causing, it is said, anæsthesia of the head and face. It is very little used, except in trifacial neuralgia.

CHLORALAMID.

What is chloralamid? and with what is it incompatible?

A product of chloral hydrate and formamid, occurring in colorless crystals of somewhat bitter taste; slowly soluble in 19 parts of water, and easily so in alcohol, from which solution it is not precipitated by water. It is *decomposed* by *alkalies* and by a temperature of 140° F.: hence should never be prescribed in warm solutions.

What effects does it produce? How is it different from chloral?

Containing, as it does, about two-thirds by weight of chloral hydrate, we would expect to find it acting similarly, but this is not true throughout the entire range of its action. Upon the respiration and circulation in proportionate dosage its effects are almost *nil*, although slight decline in blood-pressure may follow large doses. It is entirely non-irritating even in strong solutions, and gives rise to no digestive disturbances. It acts feebly upon the spinal cord, but upon the cerebrum its effects are pronounced (Wood). In medicinal doses (gr. xxx) it induces a natural and refreshing sleep, lasting from six to nine hours, and is in most cases entirely free from any unpleasant accompanying or after-effects. Large doses (gr. xlv to ʒj) occasionally cause headache, dizziness, nausea, and slight intoxication. It seems to a slight degree analgesic, but its principal use will be as a pure hypnotic. One theory of its action is that a *slow conversion* takes place into chloral hydrate by the alkaline blood, the absence of depression being ascribed to the slowness with which this takes place, and also to a possible stimulant effect by the formamid element. So far, neither "habit" nor "tolerance" has been noted. It is cheaper than sulphonal, acts more quickly, and is apparently as free

from depressing effects. It should be given in a dose of gr. xxx (or gr. xv repeated) and in alcoholic solution.

POTASSII BROMIDUM.

What are the preparation and properties of potassium bromide?

The bromide of potash is prepared by the reaction of ferrous bromide and potassium carbonate, the potassium bromide remaining in solution and crystallizing on evaporation. It is a colorless, crystalline, anhydrous salt, of saltish taste, easily soluble in water, as are all the bromides in common use, that of sodium being least so (1 : 12).

What are its physiological effects?

Locally applied, it obtunds the sensibility of mucous membranes.

Nervous System.—Upon the cerebral cortex it exerts a marked sedative effect, and especially diminishes the irritability of the motor area. These effects are due to anæmia from vaso-motor spasm (?) or to a direct action on the nervous tissues. *Reflexes* are *diminished*, from paralysis partly of reflex centres and partly of afferent nerves and their end-organs. Painful and tactile sensations are diminished, but the *motor nerves* are *not affected*.

Circulation.—The activity of the heart is lessened, the pulse becoming slower, with lengthened diastole, from sedative effect on the sympathetic system. On vaso-motor apparatus its effects are still *sub judice*. Arterial tension is probably lowered.

Respiration is diminished in frequency, and a slight fall of temperature occurs. Exhalation of CO_2 is lessened.

Secretions are increased, but, unlike the iodides, it produces no lachrymation, salivation, or naso-pharyngeal catarrh. Large doses may cause diarrhœa. The urinary effects appear to vary, the excretion of urea being probably lessened. It exerts a marked sedative effect on the genito-urinary tract, the vesical irritability being lessened and genital excitement allayed. The drug is slowly eliminated in its own form in all the excretions, but principally those of the kidney, skin, and intestines.

What are the symptoms of bromism?

Acute poisoning does not occur. After continued use *bromism* occurs, a chronic poisoning which may result in death. The symptoms of this condition are anæmia and malnutrition, mental weakness and aberration, somnolence, hallucinations, and even a mild form of mania; an eruption, generally of acne and occasionally eczematous; hoarseness, aphonia, loss of co-ordination, and a feeling of muscular weakness; loss of sexual desire and impaired sensibility of the mucous membranes, as is well seen in the pharynx, titillation of which does not excite retching.

These symptoms subside on withdrawing the drug, and are less severe when it is administered with Fowler's solution or when the mixed bromides are taken.

In what conditions is bromide of potassium employed?

This drug acts as a *hypnotic* in conditions of mental excitement, hysteria, and *nervous over-excitability* generally. Combined with chloral it is valuable in delirium tremens. In the restless forms of insanity it is well combined with chloral or cannabis indica, but is contraindicated in melancholia.

As an antispasmodic it is valuable in the reflex *vomiting of pregnancy*, *nausea marina*, *uterine disorder*, *or migraine;* in *tetanus*, probably constituting the best treatment when given in large doses; in *chorea*, *whooping cough*, and *convulsions* generally as an adjuvant to other measures.

From its sedative effect on the genito-urinary organs it is useful in *nymphomania*, *chordee*, excessive venereal desire, *masturbation*, *spermatorrhœa*, etc. It is also of avail in the nervous *disturbances* of the *menopause*. Neuralgias may be benefited if not dependent on anæmia. Its greatest efficacy, however, is in the treatment of *epilepsy*. It succeeds better in *grand* than *petit mal*, but is often useful in the latter. It should be given in large doses until mild bromism is produced, and must be continued for a long period after attacks have ceased. Tachycardia of functional origin or symptomatic of exophthalmic goitre is often relieved.

How is it administered, and with what cautions?

Dose gr. xv to ʒj or more in elixirs or syrups; its saline taste may be lessened by the addition of sodium bicarbonate. It should not be long continued in conditions of malnutrition or anæmia.

SODIUM BROMIDE.

How does it compare with the potassium salt?

The preparation, chemical and physical properties, and uses of this salt correspond closely with those of potassium bromide. It is less disagreeable to the taste, less depressing, and by some is considered to be less liable to cause symptoms of bromism.

AMMONIUM BROMIDE.

It is formed by the precipitation of a solution of bromide of iron by aqua ammoniæ, the desired salt remaining in solution. It is crystalline, but not permanently so, and is more often seen as a powder. It is analogous to the potassium compound, but is somewhat *less active* and *more disagreeable* to the taste, and causes more gastric irritation. By some it is said to be less depressing to the heart, but probably all the symptoms of bromism may be caused by it. Its physiological action is not fully understood. It does not so readily produce acne. It may be used to fulfil the same indications as potassium bromide, and especial efficacy is claimed for it in *pertussis* and *acute rheumatism*.

What other preparations have similar effects?

Lithium Bromide, an expensive salt with no particular advantages,

contains a larger proportion of bromine than other bromides. It is said to have proved efficacious in some cases of epilepsy in which other bromides have failed. Dose, gr. xv to ʒss.

Acidum Hydrobromicum Dilutum, a 10 per cent. solution of the gaseous hydrobromic acid in water, acting much like the bromides, but being more irritant to stomach; it should be well diluted. Indications as for bromides. It is also used as a corrigent to quinine, preventing the headache and tinnitus aurium so often caused by that drug. Dose in its officinal dilution, ʒj–ij.

SULPHONAL OR SULFONAL.

When was it introduced, and what are its properties?

This substance, chemically *diethyl sulfon-dimethy-methane*, was first brought to professional notice in 1888. It occurs in very stable crystals, very insoluble in ordinary solvents, and is tasteless and odorless.

What is its principal effect?

In medicinal doses, gr. xv to xxx in man, it produces a quiet sleep. Owing to its insolubility, and consequent slow absorption, its hypnotic effects are not produced until one half to two hours have elapsed, and are apt to be protracted, causing lassitude and mental confusion during the succeeding day. Its mode of action is not clear. There seems to be no cardiac or respiratory depression, and the motor and sensory nerves are unaffected; hence *not analgesic*. Convulsions may occur in animals, but have not been noticed in man.

What of its therapeutic use and administration?

As a *pure hypnotic* it is very valuable, being safer than, but not so certain as, chloral; useless when pain exists. It is used in the *insomnia* of mental over-exertion or nervous excitement, of hysteria, and of insanity. Small doses, gr. iij to vj, often prove antiemetic. It should be administered in powder form, stirred up in warm milk, broths, etc., about one and a half hours before sleep is desired. Tablets and pills may escape absorption.

AMYLENE HYDRATE.

What is it? What are its effects? Its uses?

A colorless *liquid* of penetrating odor and somewhat pungent taste, readily miscible with alcohol in all proportions, and soluble in 8 parts of water; introduced in 1885. Moderate doses induce sleep without depression of organic functions; large doses may cause narcotic symptoms, with paralysis of centres in medulla. In medicinal doses, ♏xx to xl, it is a safe and moderately reliable hypnotic but is inferior to chloral and sulphonal in activity.

PARALDEHYDE.

What is paraldehyde? and how does it affect man?

A colorless *fluid* at ordinary temperatures, of very penetrating odor and peculiarly disagreeable taste. Ordinary doses act as a *pure hypnotic* of rather uncertain power, requiring two or three times the amount that chloral does. No unpleasant effects follow, barring an offensive breath. Very large amounts *may* paralyze respiration and circulation. An erythematous eruption may follow a single dose, while its continued use may cause malnutrition. In doses of ʒss–j or more it is a pure hypnotic.

URETHAN.

What are its chemical composition and action?

This drug, which is chemically carbamide of ethyl, occurs in crystals easily soluble in water and not unpleasant to the taste. Its administration is followed in from one-quarter to three-quarters of an hour by a *natural sleep*, without unpleasant after-effects, with no depression of circulation, and possibly slight depression of respiration. It is not as certain in its action as chloral or sulphonal. Large amounts produce paralysis of respiration in animals. It does not affect the sensory nerves.

What is its administration?

Gr. xv to ʒj by mouth or rectum.

What are its uses?

As an hypnotic; as an antispasmodic in uræmic or puerperal convulsions.

HYPNONE.—METHYLAL.

What is hypnone?

Aceto-phenone; not well known, and reports as to its efficacy are unfavorable. It is a colorless, volatile liquid, of characteristic odor and easily soluble in alcohol; dose ʒss to ʒj.

What is methylal?

Like hypnone, this is a very volatile liquid, but has a greater solubility, being dissolved by water, alcohol, and oils. It is claimed by its advocates to produce lowered excitability of the cerebral cortex, with decrease of reflex activity and a varying degree of anæsthesia, and by mouth or inhalation to produce sleep without either depression of circulation or respiration; others, however, have found it depressing to these organic functions. It is quickly absorbed and eliminated, and its hypnotic effect is of brief duration. Patients quickly lose susceptibility to the drug, and its value is still *sub judice*.

BELLADONNA GROUP.

The drugs of this group present a marked similarity of action and

uses. They cause marked mydriasis (dilatation of pupil) and a peculiar delirium; they are antispasmodic.

BELLADONNÆ FOLIA.
BELLADONNÆ RADIX.

What are the origin and active principles of belladonna?

Belladonna is the *leaves* and *root* of *Atropa belladonna*, or deadly nightshade, a plant of Europe, the whole of which contains the narcotic principle; but these parts only are officinal. Its *sole active constituent is atropina* (atropine or atropia); this occurs in crystals of a bitter, burning taste, odorless, quite soluble in alcohol and ether and in about 300 parts of cold water. The officinal sulphate is easily soluble in water.

What are the preparations of the leaves and roots?

Of the *leaves:*
Tinctura Belladonnæ (1 : 66), dose ♏x–℥ss.
Extractum Belladonnæ Alcoholicum, dose gr. $\frac{1}{8}$–$\frac{1}{2}$.
Unguentum Belladonnæ (10 per cent of above).
Of the *root:*
Abstractum Belladonnæ, twice as strong as powder, dose gr. $\frac{1}{4}$ to j.
Extractum Belladonnæ Fluidum, dose ♏j–ij–iv.
Emplastrum Belladonnæ.
Linimentum Belladonnæ.
Atropina, Atropinæ Sulphas, } dose gr. $\frac{1}{100}$ to $\frac{1}{50}$.

How does belladonna affect the nervous system?

In general, atropine may be considered to *stimulate* the *sympathetic* system, and to *depress* the *motor*, and to a less degree the sensory, nerves, thus *diminishing* the reflexes. But in therapeutic doses these effects on the motor and sensory nervous organs are probably slight. Sufficient doses excite the cerebrum, taking the form of an *active, busy delirium*, followed, if dose be toxic, by stupor, deepening into a coma, which is partially due to insufficient oxidation. (It is not a true hypnotic.) Convulsions are present or absent according as the cerebral excitement or the peripheral paralysis predominates.

How does it affect the circulation?

Heart.—After a primary slowing (?) its action is increased in rapidity from (*a*) paralysis of the inhibitory fibres of the pneumogastric, and (*b*) stimulation of the cardiac sympathetic ganglia. Large doses may prove cardiac paralyzers.

Vaso-motor Apparatus.—Sympathetic vaso-constrictors are stimulated by therapeutic doses, with a resulting increase of arterial pressure; large doses paralyze and the blood-pressure falls.

How does it affect the respiration and temperature?

Belladonna is one of our most potent measures for stimulation of the respiratory function, acting when vagi are cut—viz. by direct stimulation of the respiratory centre. Very large toxic doses cause paralysis in the same manner. The temperature also is increased by medicinal and lowered by very large doses.

How does it affect the intestinal canal?

Peristaltic movement is said to be stimulated at first; later it is doubtless lessened by depression of the smooth muscular fibres.

How does it affect the glandular system and secretions?

Secretion of salivary and muciparous glands is diminished, causing, as one of the earliest symptoms, a dryness of the mouth. This is due to depression of the terminal filaments (*e. g.* in the case of the submaxillary gland depression of the terminal filaments of the chorda tympani), with probably a stimulation of the sympathetic.

Perspiration is decreased, partly, doubtless, by stimulation of sympathetic vaso-constrictors: at the same time a bright, so-called scarlatiniform eruption may develop, followed in some cases by desquamation.

The effects on urinary and intestinal secretion are in doubt, though the urine is probably increased from diminution of perspiration, and its solids are said to be augmented. The drug is largely eliminated by the urine.

What are its effects on the eye?

Pupils are dilated, however the drug be exhibited, this mydriasis being due to paralysis of the oculo-motor nerve and stimulation of the cervical sympathetic. It is accompanied by loss of power of accommodation and diminished intraocular tension, and lasts from five to ten days. The mode of action is probably the same whether topically applied or administered internally. The sensibility of the retina is probably lessened, thus relieving the photophobia which would follow mydriasis.

What are its local effects?

It acts as a paralyzant of motor and sensory nerves, although probably not enough is absorbed through the epidermis to cause analgesia.

What therapeutic indications does it meet?

Belladonna, or its equivalent atropine, is used to fulfil the following indications:

(1) To relieve spasm in *whooping cough*, *nervous cough*, *spasmodic asthma*, and *hiccough*. It may palliate and is often used in *spasm of the sphincter ani* from fissure or other painful rectal or anal condition, and in *urethral spasm* it may be advantageously given as a suppository.

In simple *spasmodic colic*, *spasmodic dysmenorrhœa*, and *peristaltic spasm* (as in lead colic) it is valuable. In the last-named condition, where the pain and constipation are due to a tetanic condition of the muscles of

the intestinal wall, the rationale of its use is not apparent until we know that the splanchnics are largely *cerebro-spinal nerves*, and are accordingly *depressed*.

In *nocturnal incontinence of urine* in children, when due to relaxation of sphincter vesicæ or to a morbid irritability of the bladder mucous membrane, it is often of great value; also in *nocturnal emissions** and as an adjunct to cathartics to prevent griping.

(2) To diminish secretions in *ptyalism*, either mercurial or that of pregnancy; *chronic gastritis* with excessive secretion; *acute coryza*—simply palliative; *colliquative diarrhœa* and *night-sweats*—very effectual; *to diminish lacteal secretion*—either locally as an ointment or internally.

(3) As a stimulant in *shock*, where the loss of temperature is due to vaso-motor paralysis, it is invaluable.

It is also employed, but with less success, in adynamic fevers: it is valuable in collapse occurring suddenly in the course of any acute disease, and as a *respiratory* stimulant in ether narcosis.

(4) To relieve pain in *neuralgia*, especially *facial*, *sciatic*, and *ovarian*, it may prove satisfactory, but has its superiors. It should be injected into the region of the affected nerve. Locally, its effects must be slight, but it has found employment in *pruritus vulvæ*, *vaginismus*, etc.

(5) As an antidote to opium-poisoning it should be cautiously employed. (See *Opium*.)

(6) In ophthalmology atropina is much used in gr. iv to ℥j solutions for the following purposes: to dilate pupil and paralyze accommodation; for thorough *examination* in cases of suspected astigmatism or cataract, and sometimes it is necessary in examinations of the fundus; as a *remedy* in preventing adhesions of iris in iritis, and to break them up when formed, and in inflammatory conditions of the cornea, etc.

What are the diagnostic symptoms and treatment of belladonna-poisoning?

The characteristic symptoms are dryness of throat, rapid breathing and pulse, muscular relaxation, pupils dilated—often enormously so—skin eruption, active delirium with or without convulsions, passing into sleep or coma, and complete collapse. Treat by evacuation of stomach by pump, syphon, or emetic; by *chemical antidotes*—tannic acid and solutions of the caustic alkalies; then administer remedies *to prevent circulatory* and *respiratory failure*. (See *Opium*.) The physiological antidotes are morphine, pilocarpine, and physostigmine, but their use should be guided by the symptoms presented.

What is homatropine hydrobromate?

Atropine is resolvable into *tropine* and *tropic acid*. Tropine salts with

* In this condition the patient should be directed to empty his bladder and rectum thoroughly before retiring to relieve all prostatic pressure, to abstain from fluid during evening, to lie upon the side, and should be encouraged for moral effect.

Differential diagnosis of poisoning - opium - Bella. - Belladonna - Digitalis 68. Aconitum - 74.

hydrochloric acid form *tropeins*. Homatropine is a tropein derived in this manner from amygdalate of tropine. It is chiefly employed as a *mydriatic*. Its effects are similar to those of atropine, but are more quickly developed and pass away much more rapidly. This fact and its non-irritating nature render it very practical.

STRAMONIUM.

What are the botany and chemistry of stramonium?

Folia and Semen.—Leaves and *seeds* of *Datura Stramonium*, Jamestown weed. Its active principle is *daturine*, probably a mixture of atropine and hyoscyamine.

What are the preparations of stramonium?

There are no official preparations of the leaves, but they are dried and used for smoking. Of the seed we have—

Extractum Stramonii, dose gr. ¼–½.
Extractum Stramonii Fluidum, dose ♏i–iij.
Tincture Stramonii, dose ♏x–℥ss.
Unguentum Stramonii (10 per cent. of extract).

How does it differ from belladonna?

The physiological and toxic effects of stramonium correspond so closely to those of belladonna that no separate consideration is needed. Owing to the common occurrence of the weed, poisoning is rather more frequent. *Treat as for belladonna-poisoning.*

Has it any special advantages?

From its physiological effects the uses may correspond closely to those of belladonna, but it is not commonly employed. Often used as cigarette in asthma.

HYOSCYAMUS.

What are its botanical and chemical properties?

Hyoscyamus is the *leaves* of *Hyoscyamus nigra* (henbane), a European plant; plants should be of the second year's growth. It contains two alkaloids—the one *hyoscyamine*, crystalline, isomeric with atropine, and having an officinal sulphate (U. S. P.); the other *hyoscine*, amorphous, isomeric with atropine and hyoscyamine, but differing from them in physiological effects. The latter forms crystallizable salts, and is most used as the *hydrobromate*.

What are the preparations of hyoscyamus?

Hyoscyami Pulvis, dose gr. v–x.
Abstractum Hyoscyami, dose gr. ij–iij.
Extractum Hyoscyami Alcoholicum, much used, dose gr. ½–ij.
Extractum Hyoscyami Fluidum, dose ♏v–x.

Tinctura Hyoscyami (16 per cent.), most used, dose ʒss–ij.
Hyoscyaminæ Sulphas, dose gr. $\frac{1}{100}$–$\frac{1}{50}$.
Hyoscine Hydrobromate, not officinal in 1880, dose gr. $\frac{1}{100}$–$\frac{1}{60}$.

What physiological effects does it produce?

The physiological effects of hyoscyamus are very analogous to those of belladonna, hyoscyamine being nearly identical with atropine. Hyoscyamus differs in being *less energetic, less persistent* in its action, and *more hypnotic.*

Hyoscine.—This alkaloid has recently been studied, and seems to be *the hypnotic principle* of hyoscyamus. In addition to the ordinary symptoms produced by drugs of this group, it has a marked depressing effect on the cerebral cortex and the motor tract of the spinal cord, and, unlike them, it is a respiratory depressant (Wood).

What are the symptoms and treatment of hyoscyamus-poisoning?

The same as those of *Belladonna*, which see.

What indications does hyoscyamus meet?

The preparations of hyoscyamus may be employed to fulfil the same indications as belladonna—viz. antispasmodic, slightly analgesic, to diminish secretions, etc. As a respiratory stimulant it is inferior to its companion drug.

Hyoscine hydrobromate is employed as an hypnotic in sleeplessness with great mental excitement, as in mania, insanity, and delirium tremens. It is said to be safe in advanced kidney disease when morphine is inadmissible; also valuable in nymphomania, spermatorrhœa, and sexual excitement generally (Wood). It is devoid of the unpleasant after-effects of opium, and may be given in doses of gr. $\frac{1}{100}$ to $\frac{1}{60}$ by mouth or $\frac{1}{100}$ to $\frac{1}{90}$ hypodermically. Some persons show a decided susceptibility to this alkaloid, and doses within these limits have caused alarming symptoms, but no fatal cases are reported. Order Merck's preparation, as others are often incompletely separated from hyoscyamine.

DUBOISIA.

This drug, which is unofficinal, contains *duboisine*, probably identical with hyoscyamine, and its effects and uses are those of other herbs of this group. It is derived from *Duboisia myoporoides* (Nat. Ord. *Solanaceæ*), and is a native of Australia.

AGARICIN.

What is it?

A preparation of agaricus or larch fungus. Its mode of action is unknown. It is successful in colliquative sweating and excessive bronchial secretion, and may therefore be considered in this connection.

ERYTHROXYLON COCA.

Whence is it derived? What does it contain?

This drug is the *leaves* of *Erythroxylon coca*, a South American plant. It contains *cocaine*, the local anæsthetic effects of which have already been considered, and *hygrine*, a mydriatic principle.

Extractum Erythroxyli Fluidum is officinal, dose ♏xx to ʒj.

What are its physiological effects?

Nervous System.—A sense of exhilaration and stimulation of the mental faculties, followed by restlessness or "nervousness," is produced; loss of desire for sleep and lessened sense of fatigue; reflexes are at first increased, but later diminished, probably from paralysis of *afferent* and *efferent* nerve-fibres both peripherally and in the cord. Later, after large doses, delirium, inco-ordination of movement, convulsions, paralysis, and anæsthesia may ensue.

Circulation.—The heart's action is rendered more rapid by depression of the cardio-inhibitory fibres of the vagus, and a consequent increase of blood-pressure follows. *Large doses depress* the circulation.

Respiration is at first powerfully stimulated, but later, after large doses, is depressed, and toxic doses *destroy life by paralysis of this function:* these effects are *centric*, occurring when vagi have been divided. Coca increases heat-production and the body-temperature is raised.

Secretions.—Cocaine is eliminated in the urine, which may be increased; the skin may be moist: neither of these effects is constant.

Eye.—Pupil primarily slightly contracted, later *widely dilated*, by its local application; the intraocular tension is lowered and accommodation paralyzed, but to a less extent than by atropine.

What are the symptoms and treatment of the cocaine habit?

The symptoms are digestive disturbances, insomnia, emaciation, general enfeeblement of body and intellect, with tremors and loss of co-ordinate movement. Withdraw the drug. *Acute poisoning* may occur: the symptoms are restlessness and excitement, rapid breathing and muscular twitchings; later, collapse, slow and labored respiration, largely-dilated pupils, epileptiform convulsions, loss of consciousness, delusions, mania, etc. The smallest fatal dose is not certain. Respiratory stimulants are indicated.

What is the therapy of cocaine?

Coca is a nervous tonic, and may do good in melancholia, neurasthenia, etc. It will often relieve gastralgia and the pain of gastric ulcer, and check vomiting. Locally applied, it contracts the nasal blood-vessels.

SPINANTS.

Spinants are drugs tending to excite muscular contraction or motor paralysis, and may be divided into *excito-motor* and *depresso-motors.*

EXCITO-MOTORS.

As far as ordinary muscles go, the drugs so considered are those containing *strychnine* and *brucine*. Ergot and digitalis act similarly on particular organs, the uterus and heart.

NUX VOMICA.

What are its origin and active principles?

Nux vomica is the *seeds* of *Strychnos nux vomica*, an East Indian tree. It contains two alkaloids—*strychnine* and *brucine*—in combination with igasuric acid. Strychnine represents fully the activity of its parent drug; brucine being similar, but weaker, in its action.

Name the preparations of nux vomica.

Abstractum Nucis Vomicæ, dose gr. j–ij.
Extractum Nucis Vomicæ, dose gr. ¼–j.
Extractum Nucis Vomicæ Fluidum, dose ♏ij–v.
Tinctura Nucis Vomicæ (1 : 5), dose ♏v–xv.
Strychnina, Strychninæ Sulphas, } dose gr. $\frac{1}{60}$–$\frac{1}{20}$.

What are the properties of strychnine?

Strychnine is a white powder, crystallizing from its solutions, odorless, superlatively bitter, very insoluble in water, but freely so in alcohol, and present in from ¼ to ½ per cent. in the crude drug. Its sulphate is soluble in water, but its solutions are seldom used medicinally, because of their intense bitterness. It yields a violet color with oxidizing agents, and this is the basis of several tests for the drug, but the physiological test is more reliable. The latter consists in injecting some of the suspected solution into a frog or other small animal, and noting if physiological effects are produced.

What are its physiological effects?

Nervous System.—The cerebrum is unaffected and consciousness is unimpaired, except in the last stages of poisoning, when its loss is due to imperfect oxidation. Strychnine exerts a *selective* action on the motor cells in the anterior cornua, the *reflex function being exaggerated.* In poisoning, the motor nerves are depressed, partly from exhaustion and partly from a direct action on their fibres (?). The sensory nerves are little affected.

Circulation.—Heart-action accelerated and arterial tension increased by medicinal, and depressed by toxic doses.

The *respiration* is greatly stimulated. Death may result from a tetanic condition of the respiratory muscles, resulting in asphyxia, or more rarely from exhaustion.

Special Senses.—Vision and hearing are rendered more acute; tinnitus aurium may occur; the pupils are somewhat dilated.

Digestion.—From its bitter taste it excites the secretions of the gastro-intestinal tract, increasing the appetite and promoting digestion. It increases peristaltic action.

What are the diagnosis and treatment of strychnine-poisoning?

Strychnine may be used with criminal intent, and gr. ss has proved fatal to an adult. The *symptoms* of poisoning are as follows in their order of development: sense of uneasiness, jerky respiration, stiffness of inferior maxilla, and shuddering; these are suddenly succeeded by tonic convulsions, especially of extensors, causing *risus sardonicus*, opisthotonos, etc.; pallor, succeeded by cyanosis from respiratory embarrassment. These spasms succeed one another on the slightest peripheral irritation, and, if to prove fatal, cause death in a few hours either by asphyxia or exhaustion. Very large doses may cause death quickly and almost without symptoms, apparently by a profound impression on the centres of organic life.

Diagnosis.—Traumatic tetanus is the main condition from which its toxic effects are to be diagnosticated. The following points of difference may be tabulated:

Strychnine Tetanus.	*Traumatic Tetanus.*
(1) Duration short.	Duration longer.
(2) Development sudden.	Gradual.
(3) Extremities first involved.	Face first (trismus).
(4) Intermission and muscular relaxation more marked.	Less marked; spasm almost constant, especially trismus.
(5) Swallowing possible.	Impossible.

Treatment consists in (1) eliminating the poison, (2) checking the convulsions, and (3) maintaining respiration. The drug remaining in the stomach may be rendered *partially* insoluble by *tannin*, after which the stomach is emptied by emetics or the stomach-pump. The spasms may be *averted* by the joint use of *chloral* and *bromides*, but *if already present* the temporary use of ether, or even chloroform, may be necessary until these produce effects. *Artificial* or *forced* inspiration is to be employed if cyanosis develop.

Of what therapeutic use is strychnine?

Strychnine is used (1) in gastro-intestinal disorders as a stomachic tonic in *anorexia*, *chronic gastritis*, and *atonic dyspepsia*, in which conditions it should be given before meals; in *morning nausea* and the *vomiting of pregnancy and alcoholism*, which *may* be relieved; in *functional disorder* of the liver with *intestinal indigestion*, and as a tonic in cirrhosis; in constipation from inactivity of the muscular coat.

(2) In hæmic disorders, as anæmia, chlorosis, hemorrhagic diathesis, purpura, etc., it may prove a good *indirect* tonic.

(3) In relaxed conditions of the genito-urinary system, as in impotence, nocturnal emissions, incontinence of urine, etc., when atonic or

functional and not dependent on organic defect; also in amenorrhœa and neuralgic dysmenorrhœa it is occasionally used.

(4) In paralyses, *especially those of peripheral origin*, as *lead-palsy* and *peripheral neuritis*, it is often of great value, and is best administered hypodermically in the affected region. It is of less value, but may do good, when the paralysis is of *centric* origin, but is positively contraindicated during the early or rigid stages or when any acute process obtains. Amaurosis due to alcohol or tobacco, and amblyopia from disuse, as is seen in strabismus, may be cured by strychnine. In all paralyses the drug must be pushed to the production of slight physiological effects. Given hypodermically or in enemata, by stimulating respiration and circulation it is of great value in surgical shock and in asthenic conditions generally. It is partially antidotal to opium and chloral. In the dyspnœa of cardiac disease it is an efficient adjuvant to digitalis. Petit mal may be benefited by strychnine.

How may it be administered?

Strychnine is generally given in pill form, except when large doses are required, when solutions should be employed to avoid any inaccuracy of dosage. It should not be given in the same solution with tannic acid, *nor should it be combined with bromides, chlorides, or iodides*, which precipitate it partially from its solutions. Such combinations might cause the last portion to contain an over-dose. It is very readily absorbed by the rectum, and the rectal dose should be the same as by mouth.

How does brucine differ from its sister alkaloid?

Recent experiments seem to show that this alkaloid differs from strychnine in having a greater effect on the sensory nerves, being somewhat anæsthetic in strong solutions. It has little effect when taken by mouth, owing to its rapid elimination.

IGNATIA.

Ignatia is the seeds of *Strychnos Ignatia*. It contains the same active alkaloids as nux vomica, the strychnine being present in larger proportions (½ per cent. or more). Its preparations are—

Abstractum Ignatiæ, dose gr. ss–j.

Tinctura Ignatiæ, dose ♏x–xx.

Its action and uses, consequently, are those of nux vomica.

COCCULUS INDICUS (PICROTOXIN).

What is its origin? its active principle?

Cocculus Indicus is the *dried berries* of *Anamirta paniculata*, an East Indian shrub. It owes its activity to a *neutral principle, picrotoxin*, which is a white, crystalline, bitter substance somewhat soluble in water and freely so in alcohol and ether. Not being an alkaloid, it is not pre-

cipitated by substances containing tannic acid. It is officinal as picrotoxinum.

What are its effects and uses?

Like strychnine, it is a tetanizing agent, having a selective action on the centres in the medulla (Biddle), and causes death in large doses by tetanic fixation of the respiratory muscles. It produces decided diaphoresis. It is chiefly used locally as a decoction or ointment for the destruction of lice and the parasite of tinea versicolor. Lately it has been used in doses of gr. $\frac{1}{150}$ to $\frac{1}{60}$ for the *night-sweats* of phthisis. Otherwise it is little used internally.

Ergot and **Digitalis**, although muscular excitants, will be more properly considered elsewhere.

DEPRESSO-MOTORS.

PHYSOSTIGMA (CALABAR BEAN).

What are its origin and alkaloids?

Physostigma is the kidney-shaped seeds of the *Physostigma venenosum*, or ordeal bean of Calabar. These contain as their active principle an alkaloid, *physostigmine* or *eserine*. Calabarine and other alkaloids have been isolated, but are probably decomposition-products of eserine. Calabarine is believed to be a tetanizing agent. Eserine is sparingly soluble in water, but its officinal salt, the salicylate, dissolves in 130 parts of water.

What preparations of physostigma are officinal?

Tinctura Physostigmatis, dose ♏v–xx.
Physostigminæ Salicylas, dose gr. $\frac{1}{100}$–$\frac{1}{60}$.
Extractum Physostigmatis, dose gr. $\frac{1}{20}$–$\frac{1}{4}$.

What physiological effects does it produce?

The symptoms produced by full doses are giddiness, pallor and coolness of the skin, contracted pupils, muscular relaxation, weakness, and drowsiness, but no stupor; vomiting and purging may occur. Toxic doses add to these effects symptoms of respiratory embarrassment and a total loss of reflexes.

Nervous System.—The cerebrum is unaffected even by large doses, but the centres in the gray matter of the spinal cord are depressed, causing *diminution* or *complete loss of reflexes*. Depression of the motor and sensory nerves occurs only in large doses, that of the former to a greater degree. This effect is due, it is supposed, to an action on the *peripheral end-organs*.

Circulation.—Small doses slow the pulse-rate, rendering the diastole of the cardiac cycle longer. Toxic doses may arrest the heart in diastole, but the heart generally continues to beat after respiration fails. This

slowing is not due to stimulation of the vagi, as it occurs when they have been divided, but is probably the result of a direct depression of the intracardiac nervo-muscular apparatus (the heart-muscle and its contained ganglia): this, however, has not been positively proven to be its mode of action. The arterial tension is at first raised, but by toxic doses is finally lowered.

Respiration is depressed, and in fatal cases death takes place from respiratory paralysis.

Intestines.—Peristalsis is decidedly increased, a tetanic condition being produced by large doses: this is followed by relaxation from over-stimulation and exhaustion.

Eye.—The pupil is strongly contracted, probably by *local* influence—*i. e.* by paralysis of the sympathetic terminals and oculo-motor stimulation. Thus it antagonizes the effects of atropine. This *myosis* is not constant, and is not of so long duration as the mydriasis of atropia. The ciliary muscle is stimulated, the drug thus acting again in antagonism to atropine as regards power of accommodation.

What are the symptoms of toxic doses?

The prominent symptoms and signs are contracted pupils, embarrassed respiration, muscular weakness, and abolition of reflexes. Severe symptoms have been recovered from.

What is the treatment of physostigma-poisoning?

Atropine tentatively is the proper antidote. Measures against shock, as artificial warmth, etc. and artificial respiration, are to be employed as necessity arises.

What are the uses of physostigma therapeutically?

Internally, it may be used with success in tetanus, strychnine-poisoning, and convulsive conditions generally. With a good preparation of the alkaloid it will prove one of the best measures against tetanus. In chorea and bronchial catarrh with dyspnœa it has its advocates. In ophthalmology it is used to antagonize atropine or to alternate with it in tearing up adhesions, etc.

CURARE OR WOORARA.

What is curare?

Curare is an unofficinal drug of uncertain origin, being derived from different varieties of *Strychnos*, but containing no tetanizing principle. It contains an alkaloid, *curarine*, the dose of which will be gr. $\frac{1}{100}$ to $\frac{1}{40}$ or even larger by mouth, or $\frac{1}{200}$ to $\frac{1}{150}$ hypodermically. The dose of the crude drug is $\frac{1}{20}$ to $\frac{1}{4}$ of a grain.

What is its action?

Curare is comparatively innocuous by mouth. Hypodermically, its only action is to paralyze the *terminal motor-filaments*, with of course an

incidental diminution of the reflexes, the *muscular fibres* and *sensory nerves* preserving their irritability. Death is caused by paralysis of the respiratory muscles.

What are its uses?

Although it is chiefly used in physiological experimentation, it has been used in tetanus, hydrophobia, strychnine-poisoning, and muscular cramps and spasms. In all these conditions it can only be of use by lessening the exhaustion dependent upon the spasms.

CONIUM.

What is conium? and what is its active principle?

Conium is the *fruit* of *Conium maculatum*, or hemlock, a *plant* of Europe. Its active principle is *conine*, a transparent oily fluid of bitter taste and a peculiar mouse-like odor. Conine is one of the *volatile* alkaloids (the others being lobeline (?), nicotine, and sparteine), and is thus unstable, which instability and its presence in varying proportions in the plant render it an uncertain and perhaps unsafe remedy.

What preparations of conium are in use?

Abstractum Conii, dose gr. ¼–vj.

Extractum Conii Alcoholicum, dose gr. ¼–iij.

Tinctura Conii (1 : 66), dose ʒss–j.

Extractum Conii Fluidum, in which the conine is fixed by hydrochloric acid, is the best preparation, in doses of ♏j–xv.

Squibbs' Fluid Extract of Conium is a good preparation, the commencing dose being ♏x, to be increased until effects are produced.

In fact, whatever preparation is used it is safer to begin with the minimum dose and increase it in this way. Of *conine* itself the dose is ♏$\frac{1}{10}$–½.

Give the physiological effects of conium.

The symptoms produced are weakness and heaviness of extremities, beginning in the legs, disordered vision, and giddiness. Large doses cause respiratory failure.

Nervous System.—The cerebral hemispheres are unaffected except by the asphyxia of the poisoning; its characteristic effect is *paralysis of motor nerves, affecting first their end-organs*, the muscles retaining their irritability after death. Sensation and the spinal reflex centres are perhaps slightly affected by large doses. The pupils are dilated, but not constantly so.

Respiration.—The respiratory centre is not affected, but the muscles of respiration are paralyzed, thus causing death. The circulation is very little if at all affected. The temperature is slightly reduced. Elimination takes place by the urine, and the secretions are only slightly affected by the drug.

What are the toxicology and treatment of conium?

Toxic doses produce nausea, vertigo, ocular disturbances, as ptosis, diplopia, and dilated pupils, muscular and respiratory paralysis, coma, convulsions, and death. The treatment consists of *cardiac and respiratory stimulation*, especially *artificial respiration*, external warmth, etc.

What is the therapeutic indication for conium?

Conium is used medicinally to fulfil only one indication, that of *diminishing muscular excitability*. For this purpose it may be, but seldom is, used in *chorea*, *local spasms* (as blepharospasm), *acute mania* with great motor excitement, and in *tetanus* (*?*). In all these conditions it must be pushed to the production of its physiological effects.

GELSEMIUM.

What are its derivation and active principle?

Gelsemium is the rhizome and rootlets of *Gelsemium sempervirens*, the yellow or Carolina jasmine. Its preparations should be made from the fresh root, as its alkoloid, *gelsemine*, which exists in combination with a glucoside, gelseminic acid, disappears on drying.

What preparations are officinal? and which is most used?

Tinctura Gelsemii, 15 per cent., dose ♏x–xx or more.

Extractum Gelsemii Fluidum, dose ♏v–xv.

The latter is the favorite preparation. A drachm of it has caused serious symptoms, and two teaspoonsful death.

What are its effects in varying doses?

Small amounts produce few symptoms or none; medicinal doses cause languor, muscular fatigue, dizziness, ocular disturbances, and frontal headache; *large doses* are followed *quickly* by an exaggeration of these symptoms, with strongly dilated pupils, *diplopia*, *ptosis*, and sometimes internal strabismus, falling of jaw, weakness of pulse, and lessened respiration. *Toxic doses* add to these effects the following: inco-ordinate movements, coldness of surface, and unconsciousness, followed by death from paralysis of respiration.

Nervous System.—The cerebrum is unaffected. The motor tract of the spinal cord is paralyzed, this paralysis being at times preceded by a period of spinal excitability with convulsions. The depression of respiration is due either to an effect on the respiratory centre (Wood) or on the respiratory muscles (Bartholow). The ocular symptoms noted above are due to paralysis of the peripheral endings of the oculo-motor and abducens nerves respectively.

What therapeutic uses does it fulfil?

This drug may be used with success in spasmodic conditions, as tetanus, spasmodic and hysterical cough, laryngismus stridulus, and asthma; in

neuralgias, especiallly in the *facial* and *ovarian* types; in the *early stages* of *pneumonia* and *pleurisy*, in which condition it does good by lessening the frequency of the respiration and depressing the general circulation, thus lessening the liability to pulmonary stasis (Bartholow).

What is its toxicology?

Cases of poisoning are to be treated by cardiac and respiratory stimulants. In administering the drug give it until muscular weakness, slight ptosis, or double vision is complained of.

We come now to a brief consideration of two closely-allied drugs, whose therapeutic importance is very slight, and whose chief claim to interest lies in their physiological effects—tobacco and lobelia.

LOBELIA.

From what does it come? What is its active principle?

Lobelia is the *leaves* and *tops* of *Lobelia inflata*, or "Indian tobacco." Its sole active principle is *lobeline*, once thought to be a *liquid* alkaloid, but which has been shown by more recent investigation to be a colorless, odorless, *crystalline* substance.

What are the preparations of lobelia?

Extractum Lobeliæ Fluidum, dose ♏j–v.
Acetum Lobeliæ (10 per cent.), dose ♏x–ʒss.
Tinctura Lobeliæ (20 per cent.), dose ♏x–xx.

What effects does it produce?

Lobelia produces, in large doses, burning of fauces, œsophagus, and stomach; vomiting, purging, and other symptoms of gastro-intestinal irritation; slow pulse, cold sweating, and *profound muscular depression*. Toxic doses add to these effects collapse. stupor, coma, and death, which is at times preceded by convulsions. The muscular paralysis and respiratory depression are spinal in origin, while the vomiting is probably due both to local and centric action.

Has it any uses?

Its uses are few, the chief being in asthma due to spasm of bronchi as an antispasmodic. An infusion (ʒj to Oj) is recommended in the eruption produced by poison ivy, as a local application. As an emetic it is far too harsh, and is no longer used.

What is its toxicology?

For symptoms of poisoning see above. The treatment consists in copious draughts of warm solutions of *tannic acid*, its antidote, with stimulation by alcohol and ammonia.

TABACUM (TOBACCO).

What is tobacco?

Tobacco is the dried *leaves* of *Nicotiana tabacum*, an indigenous plant. Its active principle is *nicotine*, a *volatile*, liquid, and very potent *alkaloid*, colorless, transparent, and having the odor of tobacco. It is freely soluble in water. When tobacco is burned, nicotine does not appear in the smoke, *pyridine* and *collodin* being formed. It is said that collodin is less active, and is present in greater amounts in cigar smoke, while in that from pipes pyridine preponderates.

Are there any preparations?

Tabacum alone is officinal. Extemporaneous infusions, decoctions, and wines may be used.

What are its effects?

Like lobelia, tobacco is a nauseant, depressant, and an antispasmodic. The symptoms of the two drugs correspond closely, but a greater toleration for tobacco can be acquired. It increases the secretions of the salivary and intestinal glands, of the kidneys, and of the skin. It slows and depresses the heart and lowers the arterial tension. Death is due to respiratory, and occasionally to cardiac, failure. Its continued use by smokers often leads to chronic pharyngitis, gastric disorder, nervous depression, amaurosis either functional or due to retinal atrophy, and "irritable heart." These effects are especially marked in the young, and even mental deterioration seems to follow its use. Nicotine itself is a very rapid poison, death having resulted almost immediately from a toxic dose. The indications in poisoning are the same as for lobelia.

What are the uses of tobacco?

Although its use is not to be recommended on account of the danger entailed, it has been employed as a depressant antispasmodic in asthma, tetanus, strychnine-poisoning, and intestinal obstruction. Locally, it has been used in infusion or decoction as a parasiticide, but is dangerous and has caused death. Smoking, when indulged in moderately, seems in some to stimulate, in others to quiet, mental activity.

NITRITE GROUP.

We come now to a group of drugs acting in a dominant way upon the *spinal cord* and *circulation*. It includes amyl nitrite, the nitrites of sodium and potassium, and nitro-glycerin, the last being chemically a nitrate, but probably converted into a nitrite in the blood.

AMYL NITRIS (AMYL NITRITE).

What are its physical properties and method of preparation?

Nitrite of amyl is a pale-yellow, oily liquid, of very great volatility, a

banana-like odor, aromatic taste, and neutral or slightly acid reaction. It is formed by the reaction of amylic alcohol (fusel oil) and nitric acid.

What effects does it produce?

The effects of this drug are typical of those of the group. Inhaled in moderate amounts, it is very quickly absorbed and produces almost immediately the following peculiar train of symptoms: a sense of fulness, distension, and pain in the head, flushing of face, rapid heart-action, violent palpitation, and labored respiration. The pulse becomes *full* and *very soft*. Xanthopsia (a yellow coloring of things seen) may occur. These symptoms pass away in a few minutes. Toxic doses cause pallor of the skin, muscular relaxation, irregular respiration, and death by asphyxia. Although generally administered by inhalation, it is readily absorbed by all channels except the skin. The effects *seriatim* are as follows:

Circulation.—The *heart* is stimulated, its rate being greatly increased and its individual beats strengthened, but after toxic doses cardiac paralysis ensues. The *blood-pressure* is notably diminished from vaso-motor paralysis, principally by a direct action on the muscular coat of the vessel wall. The cardiac effects are due to (1) a probable initial stimulation of the nervo-muscular apparatus of the heart; (2) paralysis of the vagus; and (3) the sudden relief from the resistance in front.

Nervous System.—Motor paralysis and loss of reflexes occur, due to depression of the motor part of the spinal cord. It is *not anæsthetic.*

Blood.—The hæmoglobin of the blood is converted into a substance, probably methæmoglobin, but this action is *only partial.* The color of arterial blood approaches that of venous, and in poisoning both become chocolate-colored. Owing to this *lessened oxidizing power* of the blood the *temperature is depressed.*

What are the therapeutic uses of amyl nitrite?

It is used as an antispasmodic in the following conditions:

In *angina pectoris*, in which, by overcoming the accompanying increase of arterial tension, it gives marked and immediate relief whatever may be the causative condition.

In *asthma*, the attacks of which may generally be relieved, especially when of purely bronchial type with no underlying cardiac or emphysematous condition.

Epilepsy.—In cases in which an *aura* precedes, giving an opportunity for its administration, it will abort the attack; in the constantly recurring spasms of the status epilepticus it is invaluable, theoretically, by lessening the arterial spasm of the motor area which is supposed to cause the convulsion. The "nitrite-of-amyl pearls" are very convenient for this purpose. They are delicate glass capsules containing the drug, and may be carried by the patient, broken on his handkerchief, and inhaled.

In spasmodic conditions generally, as in *tetanus*, strychnine-poisoning, puerperal convulsions, uræmia, etc., it may prove valuable.

In the heightened arterial pressure of renal disease it is used, but nitro-glycerin is preferable from the longer duration of its effects.

In *migraine*, when due to arterial spasm, and in *nervous dysmenorrhœa*, it may prove palliative.

It is also used as a *cardiac stimulant* in sudden syncope, profuse hemorrhage, and the cardiac failure of chloroform narcosis, but care should be exercised not to increase the existing cardiac depression by too large a dose; dose, ℥ij–v, by mouth or inhaled.

NITRO-GLYCERIN (GLONOIN).

How is nitro-glycerin formed? How used? What are its properties?

Nitro-glycerin (also called trinitro-glycerin) is a colorless, oily liquid, of a specific gravity of 1.600, formed by the action of *nitric* and *sulphuric acids* on glycerin. It is a violent explosive, and is generally used in medicine in a *1 per cent. alcoholic solution*, known as *glonoin*, the dose of which is gtt. ss to iij. Efficient tablet triturates are also much used.

What are its physiological effects?

Nitro-glycerin acts upon the circulation, blood-pigments, spinal cord, and muscles as does amyl nitrite, but *differs in its slower action, less vaso-motor depression, and greater tendency to produce headaches.* It takes effect in from five to ten minutes, and these effects are not protracted beyond an hour, so that in order to maintain a constant effect it must be frequently repeated.

What are its uses?

Its uses are those of Amyl Nitrite (which see), with the exception, of course, of epilepsy, in which the volatility of the latter gives it the preference. Glonoin is much better when it is desirable to maintain a steady reduction of arterial tension.

POTASSII NITRIS (POTASSIUM NITRITE).

SODII NITRIS (SODIUM NITRITE).

What other drugs have similar effects?

The nitrites of potassium and sodium. These salts are crystalline, deliquescent, and freely soluble in water, in which last respect they have the advantage of nitro-glycerin, to which they are closely analogous in their effects. They are liable to contamination by *nitrates*, and are said to produce disagreeable eructations. Their uses would correspond to the above drug; dose gr. ij–iij.

CARDIAC STIMULANTS.

Cardiac stimulants are drugs which are used to promote the force

of the circulation. No general rule for their method of action can be laid down.

AMMONIA.

What is ammonia?

Ammonia is a colorless, very irritant *gas*, very alkaline, and very soluble in water. It is obtained as a waste product in the manufacture of coal-gas. It enjoys a wide range of therapeutic uses, but may be best considered under this heading.

What effects has it physiologically?

Locally, solutions of ammonia act as powerful irritants, causing painful vesication of the skin and mucous membranes. *Inhaled*, ammonia causes irritation and inflammation of the air-passages. *Swallowed* in strong solutions, it produces vomiting, epigastric pain, bloody diarrhœa, and *other symptoms of gastro-intestinal irritation*, with at times convulsions of spinal origin. Death may rapidly ensue from œdema of the glottis, or long afterward from pyloric stricture or other resulting structural changes.

Circulation.—To this function ammonia is a rapid, diffusible stimulant, increasing the heart-action by stimulation of the cardiac accelerators: it also increases the blood-pressure, *not* by stimulation of the *general* vaso-motor system, for it occurs after spinal section, but perhaps by a direct action on the peripheral nervo-muscular structures.

The *respiration* is accelerated by *direct stimulation* of the *respiratory centre*. The secretion of the bronchial mucous membrane is increased, and, indeed, the drug appears to exert a selective action on mucous membranes generally. It is not an hepatic stimulant. Ammonia is readily absorbed, however administered, and exists as such in the blood. It is *quickly* oxidized, and is eliminated by the urine as *nitric acid* and *urea*, thus giving the urine an *acid* reaction when ammonia itself or its tartrate, carbonate, or chloride is administered.

What are its preparations, and their characteristic features?

Aqua Ammoniæ Fortior (28 per cent. ammonia), external use only: a powerful corrosive poison. See *Toxicology*.

Aqua Ammoniæ (10 per cent.), } well diluted, dose ♏x–℥ss.
Spiritus Ammoniæ (10 per cent.), }

Spiritus Ammoniæ Aromaticus (contains ammon. carbonat., 4 per cent.; aq. ammoniæ, 10 per cent.; flavored with the oils of lavender, allspice, and lemon), a favorite and agreeable antacid, stomachic, and stimulant; dose ℥ss–j.

Linimentum Ammoniæ (aq. ammon., 30 per cent.; ol. gossip. semin., 70 per cent.).

Liquor Ammonii Acetatis (spirit of Mindererus) contains 7½ per cent. of the salt, and is used principally as vehicle; dose ʒss–ij.

Ammonii Carbonas (sal volatile), dose gr. v–x.

Ammonii Chloridum (muriate of ammonia or sal ammoniac); has an officinal *troche*, gr. ij in each; dose gr. v–x.

Ammonii Phosphas, dose gr. x–xxx.

The *nitrate* and *sulphate* are officinal for pharmacopœial purposes only, while the *benzoate*, *bromide*, *iodide*, and *valerianate* produce the effects of the other constituents, and are not properly treated of here. All are officinal.

What therapeutic value has ammonia?

It is used—

As a *cardiac stimulant* in syncope from cardiac disease or hemorrhage, in chloroform narcosis, surgical shock, snake-bites, or hydrocyanic poisoning, or in cardiac failure occurring in infectious diseases; its action is very evanescent, and frequent repetition is necessary. For inhalation the spirit, and for mouth or hypodermic use the aqua, are preferred.

As a *blennorrhetic expectorant* in acute bronchitis or pneumonia after the subsidence of the acute stage (carbonate preferred), and in chronic bronchitis with profuse expectoration (chloride).

In *hepatic disorders*, whether functional or due to structural changes, as beginning fatty and cirrhotic liver, catarrh of the bile-ducts, etc., the chloride is efficacious, its modus operandi being, however, not clear.

In *acute exanthemata* with circulatory depression and high temperature the liquor ammon. acetatis is much used as a mild febrifuge and stimulant.

In *catarrhal* conditions of the *stomach* or *intestines* the chloride does good, but the continued use of this or any other alkali is not advisable.

In gastric acidity with vomiting and headache the carbonate in solution in liq. ammon. acetat is a valuable remedy; also in combating the after-effects of acute alcoholism.

In *cystitis* the ammonia salts above mentioned are useful, and the benzoate is particularly valuable by acidifying the urine and disinfecting the mucous membrane of the bladder.

Ammonia-poisoning and its treatment.

Poisoning may occur by the ingestion of the stronger ammonia-water. The symptoms are those of corrosive poisoning, and have already been mentioned. The treatment consists in the administration of dilute acids, as vinegar, lemon-juice, etc.

ALCOHOL.

What is an alcohol? What is alcohol? How obtained?

An alcohol is an *organic compound*, the hydrate of some one of the methyl series. (Thus, methyl hydrate, CH_3OH, is methyl alcohol or fusel oil; C_2H_5OH is ethyl hydrate or ethyl alcohol, or *alcohol*.) Alcohol is obtained by *fractional distillation* from the liquids in which it exists, having been formed in these by *vinous fermentation* of grape-

sugar or *starches*. These substances are changed under the action of a ferment, the former directly into alcohol and carbonic acid; the latter first into glucose, and then undergoing the same change secondarily.

What important features has alcohol?

Officinal alcohol, ethyl alcohol (C_2H_5OH), is a colorless, inflammable, and volatile liquid, having a strong affinity for water, and reacting to sulphuric acid, with the production of ether and water. Consisting of so large a percentage of unoxidized C and H, alcohol is evidently capable of considerable oxidation and consequent energy. The ultimate results of oxidation are CO_2 and H_2O.

What are its physiological effects?

The effects of alcohol are (1) *primary*, which follow when topically applied or when circulating as such in the blood; and (2) *secondary*, which result from long-continued use.

Locally, alcohol applied to the skin is slightly irritant, especially if evaporation be prevented; abstracts water from the tissues and hardens the epidermis; it evaporates with a cooling and slightly anæsthetic effect.

Internally, in *small doses well diluted*, it stimulates glandular secretion by (1) causing a superficial congestion of the mucous membrane, and (2) by a direct stimulation of the orifices of the glands, causing an outpouring of their secretion. Hence the appetite and digestive powers are promoted. When, however, too concentrated or in too large an amount, it precipitates the pepsin secretion, causes nausea, vomiting, and loss of appetite, interferes with digestion, and produces certain pathological changes to be described later.

Nervous System.—The cerebral effects vary with the size of the dose. They are characterized by *mental exhilaration*, especially of the *emotional faculties*, often spoken of as *stimulation*, but it is rather a blunting of the higher mental powers of reason and judgment by which the emotional are generally controlled: the phases of intoxication are too familiar to need enumeration. Somnolence and stupor follow, often very quickly when large doses are taken. The other cerebro-spinal effects in their order of appearance are—further *disorders* of *intellection*, resulting in any phase of intoxication or brutality; disorders of *motion* and *sensation:* the sensory disturbance may take the form of dysæsthesia, paræsthesia, or anæsthesia, and generally begins in the lower extremities (occasionally the face) and advances upward: these show an effect on the basic ganglia of the brain and the spinal centres; *lack* of *co-ordinating power* from (1) disordered cerebellum and (2) impaired muscular sense; finally, *death* from respiratory paralysis, due to involvement of the medulla.

As a general rule, then, the highest centres are first affected, and the others in the order of their importance.

Circulation.—The *heart-action* is stimulated in force and frequency, or

in frequency, the individual pulsations being of the same force and the diastole shortened: in adynamic states the force of the pulsation is said to be increased and the frequency lessened. Thus in medicinal doses alcohol is a stimulant to circulation, but toxic doses tend to depress the heart's action. Upon the *vaso-motor system* alcohol acts to dilate the cutaneous vessels by vaso-motor paresis; as results we have flushing of the surface, sensations of heat, and sweating. Upon the *blood*, into which the drug is absorbed unchanged, but diluted, it causes (1) diminution of oxygenating power by lessening the activity of the red blood-corpuscles; and (2) certain changes in the composition of the blood by its effects on the liver and digestion. (See below.) Thus the blood of drunkards contains more unoxidized fats and carbon than normal, the alcohol combining with much avidity with all the available oxygen.

The *Respiration* is at first quickened, but later is depressed, and in toxic cases death takes place from paralysis of medulla.

The *Temperature* is lowered slightly, for the following reasons: (1) The cutaneous circulation is increased and there is a greater loss of heat from radiation and diaphoresis; (2) the oxygenating power of the blood is lessened; (3) there is less muscular activity. This fall of temperature is not of importance therapeutically, but it is plain that alcohol is not an aid in resisting prolonged exposure to cold, but the opposite.

Nutrition.—Alcohol is available for immediate oxidation; hence it is an *immediate food* up to ℥j to ℥ij daily. Other substances ingested at the same time may be stored up as body-tissue to be consumed on occasion. Hence alcohol tends *indirectly* to produce fat.

What are the secondary effects of alcohol?

When habitually used alcohol has certain characteristic effects, mostly due to an interstitial hyperplasia.

Stomach.—The continued irritation of any but very small doses causes finally a *decrease* in its secretory power: there is an increased production of connective tissue, the glands are obliterated, and a chronic gastritis results.

Liver.—Alcohol is mostly absorbed in the stomach, and is thus carried immediately by the portal circulation to the liver: here, again, constant irritation causes growth of connective tissue and consequent gland-obliteration, and *cirrhosis of the liver* results. On both stomach and liver alcohol acts more harmfully when taken on an empty stomach, because of its lesser dilution. *Fatty liver* may also result from alcoholic habit.

Vaso-motor Changes.—Alcohol causes a constant paresis of the superficial vessels, one of the results of which is drunkard's acne. It is also a potent factor in the production of atheroma of the vessel-walls.

Nervous System.—Here too, probably, the effects are due to increased connective tissue (neuroglia). Among other conditions thus brought about are *amaurosis*, alcoholic *neuritis*, *epilepsy*, *general paresis*, alcoholic *tremor*, and *delirium tremens*.

With what conditions may profound alcoholism be confounded?

Intercranial hemorrhage, opium narcosis, and cerebral concussion may all closely simulate profound alcoholic coma. Diagnosis of these conditions is by no means easy, and indeed often impossible, in the absence of a history of the case. Do not give too much weight to the odor of laudanum or alcohol in the breath, nor to the condition of the pupils: *nothing is positively diagnostic.*

What is the treatment of acute alcoholism?

Evacuate the stomach if necessary; employ warmth to the extremities and faradism to the respiratory muscles.

What are the therapeutic uses of alcohol?

In *adynamic conditions*, as continued fevers, given in ʒij to ℥ss doses frequently, it really acts as a *food* rather than a stimulant.

In *acute inflammations* with *cardiac depression*, particularly pneumonia, it is a valuable stimulant.

In *atonic dyspepsia*, in small doses with or after meals, it is of benefit in some cases, but should not be too long continued, lest a habit be engendered; and the fact that, like all aids to gastric digestion, its continued use may lead to ordinary dyspepsia should also be borne in mind. The stomach becomes dependent upon them, and when they are withdrawn dyspepsia ensues.

In the summer diarrhœa of children, cholera infantum, and diarrhœal disorders generally brandy is particularly serviceable because of its astringency.

Chloroform inhalation should be preceded by ℥j or ij of whiskey or brandy. They are also used with great advantage hypodermically in cardiac failure, shock following severe surgical operations, or in any sudden depression.

Alcohol in large doses forms one method of treating diphtheria.

In *pulmonary* and other forms of *tuberculosis* alcohol does good as a digestive aid and *food*. It should be given in small doses with the meals; if digestion is disordered, it is doing harm and should be stopped.

In *delirium tremens* it acts as a food and cardiac tonic, and is often very valuable, especially in that type of the disease characterized by inanition.

Insomnia may be relieved by some alcoholic beverage just before retiring.

Vomiting is often checked by effervescing wines.

Locally, alcohol is used as a prophylactic against bedsores or chapped nipples, doing good by hardening the skin, and as an evaporating lotion in bruises, sprains, etc.

How should alcohol be administered?

In prescribing alcohol remember that patients at the extremes of life, childhood and old age, bear the drug poorly. Certain conditions, nota-

bly shock following injury, venomous bites, and severe hemorrhage, call for large doses. Habit causes lessened susceptibility to the drug. It should never be prescribed for any great length of time, lest the alcoholic habit be formed.

What preparations contain alcohol?

The *officinal* are—

Alcohol (Rectified Spirit, Spirit of Wine), a liquid containing *by weight* ethyl alcohol 91 and water 9 per cent. (by volume 94 and 6 per cent. respectively).

Alcohol Dilutum, practically equal parts of water and alcohol; used only for pharmaceutical purposes; is known as "proof spirit."

Spiritus Vini Gallici (Brandy), obtained by the distillation of fermented grapes, and at least four years old. Contains about 45 to 50 per cent. of alcohol by volume. Among the ingredients is *tannic acid*, to which it owes its astringency.

Spiritus Frumenti, obtained by distillation of fermented grain; same alcoholic strength as brandy, but is not astringent. Should be two years old.

Vinum Album contains 10 to 12 per cent. absolute alcohol.

Vinum Album Fortius, 20 to 25 per cent. absolute alcohol.

Vinum Rubrum, 10 to 12 per cent. absolute alcohol: red wines are more astringent than white, as they contain more tannic acid.

Unofficinal alcoholic liquids in general use are as follows:

Spiritus Sacchari (or Rum), obtained from the distillation of fermented molasses.

Spiritus Juniper. (Gin); this is distilled from rye or barley and flavored with juniper-berries, to which it owes its *diuretic* properties, and with various other substances as an adulteration.

Vinum Portense (Port Wine) has 30 to 40 per cent. alcohol; generally formed artificially and heavily fortified.

Vinum Xericum, also made artificially; a dry wine.

The *sparkling wines*, of which champagne is an example, are sweet, contain from 8 to 12 per cent. of alcohol, and are charged with CO_2. They are bottled before fermentation ceases.

The *malt liquors* are *beer*, *ale*, and *porter*, in the reverse order of their alcoholic strength. They contain from 2 to 6 per cent. of alcohol, besides extract of malt, CO_2, etc.

DIGITALIS.

What is digitalis? and what are its active principles?

Digitalis is the *leaves* of *Digitalis purpurea*, or foxglove, of the second year's growth. Its habitat is Europe, but it is cultivated in this country: the European leaves are better. The active principles are still in dispute. It contains four *glucosides:* (1) *digitalin*, which probably most nearly represents the drug, and is soluble in alcohol, but not in water; (2) digi-

talein, soluble in both water and alcohol; (3) *digitonin*, which resembles saponin in its action, but slightly differs chemically, and is soluble in water, but only slightly so in alcohol; and (4) *digitoxin*, a very active constituent, insoluble in water and only sparingly so in alcohol. Digitonin probably represents the diuretic action of the drug, and as, being insoluble in alcohol, but soluble in water, it is present in the infusion and not in the tincture, the former is the better diuretic preparation.

What are the preparations of digitalis?

Pulvis Digitalis, dose gr. j.
Abstractum Digitalis, dose gr. ss–j.
Extractum Digitalis, dose gr. ¼.
Extractum Digitalis Fluidum, dose ♏j–iij.
Tinctura Digitalis, 15 per cent., dose ♏v–ʒss.
Infusum Digitalis, 1.5 per cent.; ℥j = about gr. vij of powdered drug: is flavored with cinnamon, dose ʒj–ʒss.
The unofficinal *digitalin* of commerce is of uncertain strength and varying composition. Dose about gr. $\frac{1}{60}$.

What are its physiological effects?

The most important effects of digitalis are upon the—
Circulation.—Heart: digitalis *strengthens* the *systole* and *prolongs* the *diastole* of the cardiac cycle. The heart's action thus becomes slower and stronger. Lethal doses stop the heart in systole, a tetanic condition. The *slowness* of pulse is due to stimulation of the vagus; the *increased strength* of the heart-beat, to a stimulation of its *muscle and contained ganglia*. After toxic doses we get a weak and rapid pulse from overstimulation and paralysis of the same points. The vaso-constrictors are stimulated, and this, with the increased energy of the heart's action, causes *greatly increased arterial pressure*. Poisonous doses, however, paralyze the vaso-constrictors and the arterial pressure is lowered.
Nervous System.—This is not affected by medicinal doses: after very large or toxic doses some cerebral disturbance and *lowered reflex excitability* occur. It is also a *depressor* of *motor nerves* and *muscular tissue*.
Gastro-enteric.—Large doses are irritant, causing nausea, vomiting, at times diarrhœa and other symptoms of gastro-enteric irritation. Prolonged use may cause loss of appetite. In acute poisoning empty stomach if necessary, and give diffusible stimulants, as whiskey or ammonium carbonate.
The *Temperature* is slightly lowered, but this is not of therapeutic importance.
The *urine* is *increased* in amount by digitalis, the *urea and uric acid being diminished* because of lessened tissue-metamorphosis, and the other urinary solids increased. Its mode of action as a diuretic is disputed: by some it is held to be entirely due to increased blood-pressure in the

kidneys; by others that there is a distinct stimulation of the Malpighian tufts (Brunton).

Digitalis stimulates uterine contractions and lessens sexual appetite.

Is digitalis cumulative?

By many it is held that after continued administration of the drug sudden alarming symptoms may be developed. Others deny this, and claim that in the strictest sense it is *not* cumulative, but that these effects are due to the slow elimination of the drug, so that the doses overlap each other as it were, and that the same would be true of many other drugs not considered cumulative.

What are its therapeutic uses? When is it indicated?

These depend for the most part on its effects on the circulation. Digitalis is indicated—

In *mitral disease*, either stenosis or insufficiency; when there is an *excess* of *blood* on the *venous* side, the symptoms of which are congestion of lungs and viscera and rapid, feeble, palpitating, or irregular heart,—in these conditions digitalis *slows* and *steadies* the pulse and gives the auricle a chance to empty itself.

In aortic disease its sphere is more limited. In *stenosis with compensatory hypertrophy* it is not indicated, and may prove dangerous in large doses, but *when this stenosis has secondarily affected the mitral valve, digitalis is useful.* "In general terms, it is indicated when the action of the heart is rapid and weak and the arterial tension low" (Bartholow).

When is it contraindicated?

Digitalis should be used *with care* in the following conditions: *fatty heart; aneurism* and cerebral endarteritis, in which conditions the increased blood-pressure might rupture the already weakened wall and cause fatal hemorrhage; in any valvular lesion *with compensatory hypertrophy*, or when such hypertrophy is evidently taking place.

What should be our guides in administration?

Bartholow advises us to be guided in its use rather by rational symptoms than by physical signs; the symptoms calling for its use being a rapid and feeble heart, low arterial tension, signs of *pulmonary congestion* (as cough, dyspnœa, cyanosis, and possibly hæmoptysis), and signs of *general congestion* (as pulsating jugulars and general œdema). Again, we are warned by another therapeutist against being guided in its use by mere signs of dilatation or hypertrophy, but rather by the way the heart is acting in relation to the increased duties it is called upon to perform.

Digitalis is also of value in *irritable heart* from excessive exertion, as seen in oarsmen, soldiers, etc.—a condition of muscular hypertrophy: from its double diuretic action it is valuable in renal dropsies, especially that of acute exudative nephritis, but still it does good in the chronic varieties: for this purpose the infusion should be given. In *cardiac dropsies* it is particularly valuable. In exophthalmic goitre digitalis

relieves the tachycardia and palpitation. In adynamic conditions, as typhoid, it is often very useful. In poisoning by certain drugs which arrest the heart in diastole and greatly diminish the blood-pressure, as aconite or muscarine, it is used with advantage. In *pneumonia* and other *acute inflammations* it has been used in the early stages with the view of lessening exudation, but is of doubtful efficacy; later it is often indispensable as a stimulant, especially in alcoholic cases. In *passive hemorrhages*, the *hemorrhagic diathesis*, and *purpura* it may be beneficial. In *menorrhagia* and *metrorrhagia* it will only prove serviceable when the condition is due to cardiac disease. In spermatorrhœa it is supposed to act as an anaphrodisiac. Hypodermic injections of its tincture, ♏xv to xxx, are valuable in sudden *cardiac depression* from any cause, as during operation or acute hemorrhage; but it is more irritating and slower of action than the tincture of strophanthus, which is therefore preferred.

Digitalis poultices over the lumbar region in the uræmic state, the patient not being able to swallow or vomiting repeatedly, seem to do good, probably more from their heat than from the drug, very little of which can be absorbed.

What are the symptoms of digitalis-poisoning? When are they apt to develop?

The characteristic symptoms of poisoning by digitalis are *gastro-intestinal* and *circulatory* nausea, vomiting, diarrhœa, profound depression, marked pallor of face, with a pulse which, while it may be full, strong, and slow in the recumbent position, *becomes rapid*, *weak*, and *irregular* when the patient assumes a sitting posture. These symptoms may follow continued use of the drug, and are said to be more apt to develop (1) after tapping in ascites or hydrothorax, which relieves lymphatic pressure and facilitates absorption; (2) after quick defervescence from some acute disease; or (3) when its diuretic action is not marked.

How should these symptoms be treated?

The treatment consists in the immediate withdrawal of the drug, keeping the patient in the recumbent position, and the administration of diffusible stimulants, as alcohol and ammonia. The minimum fatal dose of digitalis is not known.

STROPHANTHUS.

What are its important botanical and chemical properties?

Strophanthus is the pods of *Strophanthus hispidus* and other varieties of Strophanthus, a tropical climbing shrub. The seeds yield an intensely bitter glucoside, *strophanthin*, which is converted by sulphuric acid into glucose and strophanthidin.

What are its physiological effects?

Its most obvious effects, and the most interesting from a therapeutic *standpoint*, are circulatory. In *medicinal doses* (♏v to x of the 5 per

cent. tincture) it slows the action of the heart, increases its capability for work, and raises the blood-pressure. Its cardiac effects are probably due to a direct stimulation of the heart itself, while the increased arterial tension is secondary to this stimulation, together with some local stimulation of the arterial constrictors. Poisonous doses paralyze the heart and greatly reduce the blood-pressure.

Upon the nervous system the drug acts very slightly, but it is a muscular paralyzer, first increasing the tonicity of the muscular fibre, and then destroying it, the dead muscle passing directly into a state of post-mortem rigidity. Death generally results from cardiac depression, but possibly at times from paralysis of respiration. Its diuretic effects are disputed, but the weight of opinion seems to be that it acts as such in both health and disease, and especially in cardiac disorders. Large doses cause some irritation of the mucous membrane of the alimentary tract, but less than digitalis. Strophanthus is eliminated in the urine.

What are its uses and administration?

Strophanthus may be used to fulfil the same indications as Digitalis (*q. v.*), differing, however, from that drug in being much quicker of action and less protracted, and perhaps less certain. Thus it may be substituted for digitalis when a quick effect or a change of medication is desired.

Strophanthus was not officinal in the U. S. P. of 1880. Two tinctures are in use: one is 1 : 20, the other 1 : 8. The former is most used, dose ♏v–x or ♏ij–iij, frequently repeated. Strophanthin is a powerful drug, and has been used hypodermically in gr. $\frac{1}{100}$–$\frac{1}{80}$ doses.

CONVALLARIA MAJALIS.

What are its origin and active principles?

Convallaria majalis, the "lily of the valley," is an indigenous plant of the Nat. Ord. Labiatæ. It contains two glucosides—*convallarin*, which is a purgative principle; and *convallamarin*, which represents the drug in its effects upon the circulation.

What are its effects physiologically?

The rationale of its action is still obscured by a multiplicity of experiments with diverse results. It acts, however, at first to slow the pulse-rate, to raise the arterial pressure, and probably to stimulate the respiratory function. Later, after large doses, it depresses all these functions, thus resembling digitalis to a degree, but being less energetic and passing less readily into the toxic stages. It acts as a diuretic, probably *indirectly*, by increasing the blood-pressure.

What are its uses?

It is recommended in dropsies of all kinds and in valvular lesions of the heart, probably fulfilling the indications for digitalis.

SPARTEINE.

What is sparteine?

Sparteine is a volatile liquid alkaloid from *Sarothamnus scoparius*, or broom-plant. It is colorless, extremely bitter, insoluble in water, but soluble in alcohol, ether, and chloroform. Its sulphate, the form in which it is used, is freely soluble in water.

What are its effects?

These are little understood at present. It seems to increase the contractile energy of the heart and to exercise a peculiar *steadying* influence upon its action when irregular, with very little or no effect on the vascular tension. It increases the amount of urine, but whether it represents the entire diuretic power of its parent drug, or whether it has any direct kidney effects, is not clear. It depresses the central nervous system and kills by respiratory paralysis.

What are its uses?

It has been employed in *valvular disease*, *asthma*, and conditions characterized by *cardiac depression, with dropsy*, but seems particularly adapted to the *functional* or *nervous disorders of the heart.* Like other members of this group, it is recommended in Graves' disease, and may do good.

ADONIDIN.

What is its source? and what are its effects?

Adonidin is a *glucoside* derived from *Adonis vernalis*, a European plant (Nat. Ord. Ranunculaceæ). Its effects resemble digitalis. Small doses slow the heart's action and increase the blood-pressure, while large doses depress both. It is irritant to the digestive tract, but only in very large doses.

What indications does it meet?

The indications for this drug, resembling digitalis as it does very closely in its effects, may be considered the same as for that drug. It may be substituted, and is generally administered in the form of a 2 to 4 per cent. infusion of the whole herb, the dose of which is ℥ss every two or three hours.

CAFFEINA (CAFFEINE).

What are its source, nature, and physical properties?

Caffeina is a proximate principle of feebly alkaloidal powers prepared from the *leaves* of *Camellia Thea* (tea) or the *seeds* of *Caffea Arabica* (coffee), and occurring also in guarana and other plants. It occurs in white, silky, odorless crystals, soluble in 100 parts of water, the solution being neutral in reaction, but forming salts with acids.

What are its officinal and non-officinal preparations?

Caffeina, the alkaloid itself, dose gr. j–v.
Caffeinæ Citras, non-officinal, dose the same.

What effects does it produce?

In small doses caffeine is a stomachic tonic, promoting the appetite and increasing the digestive power. In larger amounts it causes cerebral excitement, with stimulation of the higher mental powers (whereas opium stimulates the imaginative). Still larger doses cause mental confusion, hallucinations, muscular trembling, and even delirium. It is, then, a *true stimulant to the cerebral cortex.* In animals convulsions, and in man muscular tremulousness, are produced, the exact origin of which is not known. Probably they are due to stimulation of spinal centres and to muscular depression.

Circulation.—This function, upon which the physiological effects are especially interesting in view of the therapeutic uses of the drug, is at first stimulated and later depressed. The heart's action is at first rendered more rapid and the arterial pressure is raised, but later the pulse becomes slower and irregular and the blood-pressure falls. No exact explanation of these effects can at present be vouchsafed, but probably it is due in large part to a direct stimulation of the cardiac nervo-muscular apparatus. Toxic doses depress both circulation and respiration and lower the temperature. It acts as a powerful diuretic, the amount of urine being decidedly increased. The effect upon the solids eliminated is still under discussion.

Elimination.—Small does are entirely destroyed in the system; large amounts are partially eliminated in the urine.

What is the therapy of caffeine?

In *migraine* and other nervous headaches with or without gastric derangement it is an uncertain remedy, in many cases, however, acting well. In *opium narcosis* it is a standard remedy, either in the alkaloidal form or as black coffee.

In adynamic conditions generally it may be used in either of these two forms as a cardiac stimulant.

In all forms of cardiac inefficiency the indications for its use are the same as for digitalis.

In renal and cardiac dropsies it is valuable, and in ascites of hepatic origin it succeeds when any diuretic is of avail. It differs from digitalis in the promptness and comparatively brief duration of its effects, and is less apt to cause gastro-intestinal disturbance.

Its complete destruction in the system would seem to indicate that it is in some degree a supporting element or *food.*

What is its toxicology and how is its poisoning treated?

Poisoning by caffeine is rare. Its antagonists are tannic acid and potassium iodide, chemically, and opium, physiologically.

CARDIAC DEPRESSANTS.

ANTIMONIUM (ANTIMONY).

Antimony and its salts now enjoy much less reputation than formerly.

What are the principal preparations of antimony?

The preparations of antimony most in use are—

Antimonii et Potassii Tartras (tartar emetic or tartarized antimony), dose gr. $\frac{1}{15}$–j.

Vinum Antimonii (tartar emetic gr. 1.8 to ℥j), dose ♏x–℥j.

Syrupus Scillæ Compositus (tartar emetic gr. j to ℥j).

Antimonii Oxidum and Antimonii Sulphidum are officinal "for pharmacopœial use." Antimonii Sulphuratum, Pilulæ Antimonii Comp., and Pulvis Antimonialis are officinal, but no longer used.

What are the effects of antimony?

Tartar emetic may be taken as a type of the antimonial preparations. *Locally*, it is an irritant, and if continued may produce an eruption of papules, vesicles, and pustules resembling small-pox. Taken internally in sufficient doses, it acts as a gastro-intestinal irritant, producing violent and protracted vomiting (which in rare cases may be absent even in poisoning), abdominal pain, choleraic diarrhœa with perhaps bloody stools, profound depression, collapse, and death. Two grains have caused death in an adult, gr. $\frac{1}{2}$ in a child. If given in gradually increasing doses marked tolerance may be established. For emetic action see *Emetics*.

Circulation.—Tartar emetic is a direct depressant of the heart-muscle, which does not respond to stimulation after death, and this, together with a direct paretic effect on the vaso-constrictors, causes extreme diminution of the vascular tension.

The *spinal cord* is depressed especially, it is claimed; the sensory portion and the reflexes are consequently diminished.

Respiration also is depressed by a *direct* action on its centre, and *indirectly* by the venous congestion and blood-changes.

Secretions.—Antimonial preparations increase them generally, and especially those of the skin, bronchi, and intestinal tract, and, like other metallic salts, are probably eliminated by the intestine.

What therapeutic uses has tartar emetic, if any?

Tartar emetic is employed as a nauseant, emetic, sudorific, and expectorant, and locally as a counter-irritant. Practically, its use is now limited to the dry stages of laryngitis, bronchitis, and asthma, in the first two of which it produces secretion, and in the last relaxes spasm as well.

What are its toxicology and treatment?

Enough has been said of the symptoms, which are those of gastro-intestinal irritation, cardiac depression, and collapse. Poisoning by antimony may closely simulate cholera. The treatment consists of *tannic*

acid, which forms an insoluble tannate, the hypodermic exhibition of morphine, and free stimulation.

VERATRUM VIRIDE.

What are its source and active principles?

This drug consists of the *rhizome* and *rootlets* of *Veratrum viride*, an indigenous plant known as American or swamp hellebore, Indian poke, poke-root, etc. It contains two alkaloids, *jervine* and *veratroidine*, which differ physiologically in some respects.

What are its officinal preparations?

Extractum Veratri Viridis Fluidum, dose ♏j to iv.
Tinctura Veratri Viridis (1 : 2), dose ♏iij to x.
Norwood's tincture is one-tenth stronger, and is not much used.

What are the physiological effects of jervine?

Jervine is a white powder, insoluble in water, ether, and alcohol, soluble in chloroform. It acts directly to *depress the cardiac muscle, does not affect the vagus, and lowers arterial pressure* both by cardiac depression *and by vaso-motor paralysis:* the pulse-rate is diminished. Reflex excitability is also diminished by a direct depression of the spinal reflex centres. Respiration is affected, and death occurs after large doses from paralysis of this function.

What effects has veratroidine?

Veratroidine, which may yet be found to be a compound substance, and closely resembles *veratrine*, causes emesis, and at times catharsis, by by its local irritation. Like its companion alkaloid, it lessens the reflexes and paralyzes respiration. It acts as a direct paralyzant to the heart-muscle, and *indirectly through the vagus*, and *does not* affect the arterial tension except by depressing the heart, having *no effect on the vaso-motor system:* before death the tension rises greatly from respiratory embarrassment.

How does veratrum viride itself act?

The parent drug itself in moderate doses causes languor, muscular weakness, and inco-ordination, and quiets the circulation, lessening the pulse-rate and lowering the arterial tension. Cases of poisoning are rare, as the emetic action of the veratroidine protects to a great degree against this, and the patient responds easily to stimulation. This renders it the safest and most manageable of all the cardiac depressants.

What are the therapeutic uses of veratrum viride?

Veratrum viride may be used to depress the circulation and lessen inflammatory exudation in acute inflammations, as the early stages of pneumonia, pleurisy, etc., but it is contraindicated in abdominal inflammations, because of its tendency to produce vomiting, and in asthenic

conditions generally because of the depression produced. It should be given guarded by small amounts of opium to prevent vomiting.

How is poisoning by this drug treated?

In toxic cases the recumbent position must be strictly enforced, with elevation of the foot of the bed, and large draughts of warm water given to wash out the stomach. Opium and free stimulation with alcohol or ammonia by the rectum or hypodermically, and general warmth to the body, complete the treatment, which is generally successful. Large amounts have been recovered from, and the minimum fatal dose is not known.

How should it be administered?

Veratrum viride should be given preferably as the fluid extract, combined with tincture of opium, and in gradually increasing and frequent doses until its physiological effects upon the circulation are manifested.

What is veratrina?

Veratrina is a powder, presumably a mixture of alkaloids, derived from *Asagræa officinalis*. When pure it is crystalline. It is extremely irritant when applied to any surface. It acts upon the circulation similarly to veratrum viride, but is also a motor paralyzer, and at times causes convulsions before the paralysis. Its therapeutic uses are very limited.

ACONITUM (ACONITE).

What is aconite? what does it resemble? and to what does it owe its efficiency?

Aconite is the *tuberous root* of *Aconitum Napellus* (wolf's bane or monk's hood), a plant of Europe and Asia. It resembles horseradish, and when mistaken for this has caused fatal poisoning. It is differentiated from horseradish by its lack of odor when scraped and the brown color of its cortex. It has a bitter, acrid taste, with a benumbing after-effect on the mouth and tongue. It contains as its active principle an alkaloid, *aconitine*, with a peculiar acid called aconitic acid. Other alkaloids are described, but the information is so much at variance that they are better omitted. The preparations called aconitia vary greatly in potency. Aconitine is a bitter, acrid, odorless, whitish-yellow powder, producing numbness of the mucous membranes, partially soluble in water, while its salts are wholly so, and readily dissolved by alcohol or chloroform.

What are its preparations?

Abstractum Aconiti, dose gr. ss–j.
Extractum Aconiti, dose gr. ¼–½.
Extractum Aconiti Fluidum, dose ♏j–iij.
Tinctura Aconiti (40 per cent.), the best preparation, ♏ss–v.
Fleming's tincture is twice as strong as the officinal, and is chiefly

used externally. Duquesnel's aconitia is crystalline and reliable; its commencing dose is gr. $\frac{1}{300}$.

What are the effects of its administration?

Topically, aconite produces numbness and tingling by its effect on the sensory nerve-endings.

Nervous System.—The cerebrum is unaffected by ordinary doses; the reflexes are diminished largely from paralysis of the peripheral sensory nerves, but partly perhaps by paralysis of the motor nerves as well.

Circulation.—This is depressed, the pulse-rate becoming at first slow, then weak and rapid, and finally irregular from direct action upon the contained motor apparatus of the heart. The primary slowing is attributable to stimulation of the inhibitory apparatus (?). The arterial pressure is greatly lessened—whether from any specific action is not clear.

The *Respiration* is depressed and temperature lowered, the former from a centric action, the latter from lessened oxidation and increased sweating. The secretion of urine is increased, and the drug is presumably eliminated therein.

Large doses produce local numbness and tingling (later becoming general), motor weakness, a sense of constriction of the throat, occasionally nausea and vomiting, and always salivation, diaphoresis, and diuresis, with circulatory and respiratory paralysis and lowered temperature. After *toxic doses* the effects are augmented, and there are added collapse with cold, clammy perspiration, stiffness and pallor of the face, dilated (or contracted) pupils, and finally CO_2 narcosis, with death from respiratory or cardiac paralysis, preceded it may be by convulsions.

What are the diagnosis and treatment of poisoning?

Tingling of the entire body-surface, and especially of the mouth, face, and extremities, is the diagnostic symptom. The indications are immediate evacuation of the stomach, recumbent posture, heat locally, *free* stimulation, and artificial respiration if the respiratory function fails.

Of what therapeutic use is aconite?

From its benumbing effects on the sensory nerves it is a valuable application in all painful affections of nerves, and internally is especially efficacious in the trifacial variety. It is of use in chronic rheumatism, gout, and other painful diseases. By reducing the activity it is of value in—

Acute tonsillitis and pharyngitis, in which conditions it is almost specific, acting as an analgesic to the painful parts, as well as antiphlogistic.

In *acute pulmonary inflammations*, as bronchitis, pneumonia, etc., its effects are good during the early stages.

In *acute pleurisy* and *peritonitis*, before the effusion takes place, it is doubly serviceable from the analgia produced.

In *febricula* and *exanthemata* it reduces temperature, and may palli-

ate or exert a prophylactic influence against the complications of the latter.

Urethral chill after catheterization may be prevented, but with careful attention to asepsis this will seldom occur. It is also recommended in septic conditions (as puerperal fever), facial erysipelas, over-acting heart, and intestinal fluxes, but is not so much used for these purposes as formerly.

PULSATILLA.

What is the source of pulsatilla?

It is the *herb* of *Anemone pulsatilla*, *A. pratensis*, and *A. patens*, found in both hemispheres, and containing an acrid oily principle which is easily converted into *anemonin*, a volatile, camphoraceous product, and anemonic acid, which is physiologically inert. The dose of the powder is gr. ij to iij. No other preparations are officinal, but of a non-officinal tincture the dose is ʒss.

What are its effects and uses?

Pulsatilla is an irritant to the skin and mucous membranes, and a depressant to the circulation, respiration, spinal centres, and peripheral nerves. It dilates the pupils and causes diuresis and diaphoresis, and is eliminated by the urine. It thus closely resembles aconite. It has proved useful in *acute catarrhs* of the *nasal*, *faucial*, *laryngeal*, and *bronchial mucous membranes*, but probably only in the *early stages*, like other depressants, and is contraindicated in inflammations of the gastro-intestinal tract, because of its irritant tendencies. It has a good reputation in epididymitis and functional amenorrhœa and dysmenorrhœa.

ARNICA.

What is its source?

Two parts of this herb, *Arnica montana*, or leopard's bane, are officinal—arnicæ flores (flowers) and arnicæ radix (rhizome and rootlets).

What are the preparations of arnica?

The number of officinal preparations is in inverse ratio to the therapeutic importance of the drug. They are—

Tinctura Arnicæ Florum (20 per cent.), dose ♏x–ʒss.
Tinctura Arnicæ Radicis (10 per cent.), dose ♏xx–ʒss.
Extractum Arnicæ Radicis, dose gr. iij–v.
Extractum Arnicæ Radicis Fluidum, dose ♏v–x.
Emplastrum Arnicæ (½ extract).

What are its effects and uses?

Locally, arnica and its preparations are irritant, producing a decided eczema on delicate skins, and decided symptoms of gastric irritation when taken internally. Of its systemic effects very little is known. It

appears to be a decided cardiac depressant, having, however, less effect on the vaso-motor system than most drugs of this class. It is not used to any extent internally. The tincture of the root is used locally.

STAPHISAGRIA.

What is staphisagria? and what are its principal effects and uses?

This drug is the *seeds* of *Delphinium staphisagria*, stavesacre or licebane, a flowering plant of Southern Europe. These contain an alkaloid, *delphinine*, which acts locally as a rubefacient and even irritant, and internally as a cardiac and respiratory depressant and paralyzer of voluntary muscles. The principal symptoms produced are dyspnœa, salivation, and vomiting. The seeds contain other alkaloids of unknown activity. It has been recommended in rheumatism, dropsy, vomiting of pregnancy, etc., but its chief use is as a parasiticide ointment (℥j–ij of seeds to ℥j) in *phtheiriasis* and *scabies*.

ACIDUM HYDROCYANICUM (HYDROCYANIC ACID).

What are the properties of hydrocyanic acid?

Pure hydrocyanic acid is a colorless, transparent, inflammable liquid, extremely deadly even when inhaled, which accident, owing to its extreme volatility, may occur when carelessly handled. It occurs in small amounts in a number of vegetable substances, especially in the bitter almond, peach-kernel, wild cherry, and cherry-laurel. It is not used in medicine.

What preparations used medicinally contain hydrocyanic acid?

Acidum Hydrocyanicum Dilutum, a *2 per cent. watery solution*, formed by the reaction of potassium ferrocyanide and sulphuric acid, or by precipitating cyanide of silver from its solutions by means of hydrochloric acid. Under the influence of light it decomposes and deteriorates; dose ♏j–iv.

Potassii Cyanidum, dose gr. $\frac{1}{15}$ to $\frac{1}{8}$.

Potassii Ferrocyanidum, used only as above indicated.

Oleum Amygdalæ Amaræ contains hydrocyanic acid, varying in amount, and developed from a principle called *amygdalin*, under the influence of *emulsin*, a ferment. It is *about four times as strong* as the officinal dilute acid, and the dose is accordingly gr. $\frac{1}{4}$ to $\frac{1}{2}$.

What are the effects of hydrocyanic acid?

Locally applied, the drug causes numbness, and may be absorbed by the mucous membranes.

Nervous System.—Small doses produce simply a calming effect upon the cerebrum, while larger ones cause giddiness, confusion, and convulsions which have been shown to be of cerebral origin, not occurring in

parts below a section of the spinal cord. The motor and sensory nerves and the spinal centres are depressed.

Circulation.—Small doses simply quiet the heart, while toxic doses stop it in diastole, apparently from a direct effect on its muscle and contained ganglia. The vaso-motor system is paralyzed after a brief period of stimulation. Blood-changes occur, the exact nature of which is not clear. There is at first excessive oxidation of the blood, the venous becoming of arterial hue, and later excessive carbonization. Outside the body a mixture of this drug with the blood produces cyano-hæmoglobin, which has little or no ozonizing power. This may take place in the body, and be one of the causes of death.

Respiration.—Ten to fifteen minims produce disturbance of this function, rendering it labored and irregular. Toxic doses cause death by paralysis of the respiratory centre. The muscles, both voluntary and involuntary, are affected by the drug, and lose partially or *in toto* their power of electric excitability after death. Elimination is rapid by the saliva, kidneys, and lungs, so that those who barely escape toxic effects rally very quickly.

What are its toxicology and treatment?

After overwhelming doses death may take place almost immediately, with hardly any prior symptoms. In the slower forms three stages are recognized (Wood): (1) a very brief period characterized by *depression of all the organic functions*, especially respiration and circulation; (2) a *convulsive stage*, in which the pupils are dilated, convulsions with spasmodic evacuations occur, and unconsciousness supervenes; (3) a stage of asphyxia, paralysis, and collapse. The most diagnostic points are the suddenness of the development of the unconsciousness and other symptoms, and possibly the recognition of the odor of prussic acid in the breath. The treatment is generally of no avail. Evacuation of the stomach, ammonia by inhalation and hypodermically, and artificial respiration are indicated, remembering that either a fatal termination or recovery may be expected quickly.

What are the uses of hydrocyanic acid?

Hydrocyanic acid is used as an antispasmodic and analgesic in a variety of conditions, as in *gastrodynia* and neuralgic abdominal conditions, and in checking persistent vomiting; in the coughing of bronchitis, pulmonary tuberculosis, and the spasmodic cough of pertussis and asthma; it is a favorite ingredient of cough mixtures, generally in some combination with opium; to allay irritability of the cutaneous nerves in neuralgia, urticaria, and prurigo; locally, ʒj–ij to water Oj.

What is its administration?

The dose of the officinal preparation is one to three drops, gradually increased, remembering that it is unstable and apt to vary in strength.

POTASSIUM CYANIDE.

What are its production, effects, and uses?

Cyanide of potash is formed by heating potassium ferrocyanide with potassium carbonate (U. S. P.). It is non-crystalline, of characteristic odor and taste, deliquescent, and readily soluble in water. Being converted by the stomach acids into prussic acid, its physiological and toxic effects are the same, and it may be substituted therapeutically. Five grains have proved fatal; dose should not exceed gr. $\frac{1}{8}$.

Oleum amygdalæ amaræ is to be carefully discriminated from the *expressed oil* of almonds, the dose of which is ad libitum. Of the **aqua amygdalæ amaræ** (1 : 1000) the dose is ℥ij–℥ss.

VEGETABLE ACIDS.

What are the officinal members of this group?

The officinal vegetable acids are tartaric, citric, and acetic, the last only being liquid, the others solid. They are all slightly cardiac depressants, and from their "refrigerant" effects—which, by the way, are by no means marked—may be considered here. They affect secretion, as do the mineral acids, increasing the alkaline and decreasing the acid secretions of glands with which they come in contact. Thus the salivary and intestinal secretions are increased. They all increase and slightly acidify the urine, and after continued use are apt to derange the digestion.

CITRIC ACID.

What are its occurrence, effects, and uses?

Acidum Citricum, citric acid, is the familiar acid of *lemon-* or *lime-juice*. It is generally used in the former (succus limonis, the juice of *Citrus limonum*). It is the mildest of the acids, non-toxic in man, and a certain prophylactic against and specific for *scurvy*. It has been used with good effect in *acute rheumatism*, but is inferior to the alkalies and salicylates.

TARTARIC ACID.

What are its preparation, effects, and uses?

Acidum Tartaricum, tartaric acid, is the acid of *grape-juice*, and is prepared from *argol*, or *crude cream of tartar*. It is the only one of the vegetable acids which yields a precipitate (cream of tartar or potassium bitartrate) with solutions of neutral potassium salts. It is cheaper than citric acid, and may be substituted for it. Its chief use is in the Seidlitz Powder (*q. v.*) and other effervescing draughts.

ACETIC ACID.

What are its preparations and their uses?

Acidum Aceticum, the officinal acid, is a liquid containing 36 per cent.

of monohydrated acetic acid, and is used as a mild caustic to warts and exuberant granulations. Acidum Aceticum Dilutum contains 6 per cent. of the same, and is the only preparation employed internally. Acidum Aceticum Glaciale is nearly absolute, is a crystalline solid at or below 59° F., and is employed as a caustic only. Acetum (vinegar) is itself officinal. The dilute acid is somewhat used as a refrigerant. Locally, it is a cooling and pleasant application in febrile conditions and in superficial cutaneous inflammations, as sunburn, while injections of vinegar and water are said to be useful in vaginal gonorrhœa.

OXALIC ACID.

Of what interest is oxalic acid?

This vegetable acid is not used in medicine, and is interesting only from its toxic effects.

What are the symptoms of oxalic-acid poisoning? What is the treatment?

The poison is taken either as the *acid itself* or as the *acid oxalate of potassium* (or "essential salt of lemons"). The symptoms produced are intense burning in the region of the œsophagus and stomach, abdominal pain, vomiting of an acid, generally bloody mucus, collapse, and in some cases paralysis. The autopsy shows erosions and perhaps perforation of the stomach, and an excess of oxalate crystals in the kidneys. *The antidote* is *lime* or chalk in the most quickly available form, as whitewash, or the precipitated calcium carbonate or syrup of lime may be administered.

ASTRINGENTS.

What are astringents?

Astringents are medicines which produce corrugation and contraction of the tissues by their local action. They are employed as tonics, as correctives to relaxation of tissues, and to prevent excessive secretory or hemorrhagic discharges. They are divided into vegetable and mineral astringents.

What are vegetable astringents?

This class includes a large number of drugs acting as above indicated, and possessing this power by virtue of *tannic acid* or its derivative, *gallic acid.*

ACIDUM TANNICUM (TANNIC ACID).

What are its chemical and physical properties?

Tannic acid is derived from nutgall by the action of *washed* ether, the water being the solvent agent. It is a yellowish-white, *non-crystalline* powder of astringent taste, and easily soluble in water. It precipitates

albumin, gelatin, and the *alkaloids*, and with iron salts forms ink. It is a *glucoside*, being changed by dilute mineral acids into glucose and gallic acid, and is *gallic anhydride*, or gallic acid minus 1 molecule of water.

What are its preparations?

Acidum Tannicum, dose gr. j to xv.
Trochisci Acidi Tannici; each contains gr. j.
Unguentum Acidi Tannici, 20 per cent., in cacao butter.

In what way are its effects produced?

Its effects throughout are due to a *local* action. It coagulates the tissue-albumin, lessens the calibre of superficial vessels, and causes diminished secretions wherever applied. It checks peristalsis. It is absorbed after conversion into gallic acid, is reconverted into tannic acid in the blood (?), where it exists as an albuminate, and is eliminated by the kidneys and intestinal canal as gallic, tannic, and pyrogallic acids. Injected into the blood, it causes multiple thrombosis.

ACIDUM GALLICUM (GALLIC ACID).

What are its source and properties?

Gallic acid is obtained by oxidation or hydration of tannic acid, either slowly by exposure to the atmosphere or quickly by means of dilute sulphuric acid. It is *crystalline*, slightly soluble in cold water, but readily so in alcohol, and should be given in alcoholic solution, from which it is not precipitated by water.

What are its preparations?

Acidum Gallicum, dose gr. v–xv.
Unguentum Acidi Gallici (10 per cent.).

How do its effects differ from those of tannic acid?

It is less irritant, and therefore preferable for internal administration with a view to *remote* astringency, although some writers deny to it anything but a local astringency. Its local effects are similar to, but less in degree than, those of tannic acid. The following table expresses these differences and others:

Tannic Acid.	*Gallic Acid.*
Non-crystalline.	Crystalline.
Soluble in water.	Slightly soluble only.
Not readily absorbed as such.	Readily absorbed.
Precipitates albumin and gelatin.	Does not.
Locally astringent only.	Remotely (?) astringent.

What are the therapeutic differences of tannic and gallic acids?

From their different physiological action various differences result in their use. Thus, *tannic acid* is valuable in hemorrhages and increased

secretions where local application is possible, as in *hæmatemesis* and *intestinal hemorrhages*, either from simple or typhoid ulcers or from portal congestion, but not in those resulting from acute inflammation; in *epistaxis* and *oozing from large* surfaces, as a styptic; in gastric catarrh from relaxed conditions of the mucous membrane; in *diarrhœas* when acute stages have subsided, and especially in *chronic diarrhœa*, *chronic dysentery*, and the *colliquative diarrhœa* of phthisis, generally with opium; in *mercurial stomatitis*, *elongated uvula*, and *relaxation of the palate*, as a mouth-wash or gargle; in the various forms of *conjunctivitis* and *keratitis;* in chapped nipples and soreness of the feet, to harden the skin: for the former glycerite of tannin is especially good; as an *antidote to all the alkaloids and to tartar emetic:* with the former it forms an insoluble tannate; in *hemorrhoids* it is a good ingredient in ointments; in *catarrh of the cervix* and *body of the uterus* tampons of glycerite of tannin, or iodoform and tannin in powder form, are particularly valuable; in the chronic vulvitis or chronic otorrhœa of children glycerite of tannin is of service.

Gallic acid is used as follows by those who consider it to have a remote action:

In *pulmonary* and *renal hemorrhage;* in the *hemorrhagic diathesis*, as evidenced by menorrhagia, hæmaturia (when not malarial), epistaxis, or purpura, it should be given, alternating but not combined with iron compounds, or combined with ergot and digitalis; in chronic bronchitis with profuse expectoration; in the *colliquative sweating* of pulmonary tuberculosis it is often used, combined with belladonna or hyoscyamus or alternating with zinc oxide.

The following vegetable astringents owe their activity principally to the tannic acid they contain:

GALLA.

What are its source, preparations, and uses?

Galla, or nutgall, is the *excrescences* on *Quercus lusitanica* (variety Infectoria), or dyer's oak, caused by the puncture of an insect (*Cynips quercusfolii*) for the purpose of depositing its ova. It yields its properties to water and alcohol, more readily to the former. Two varieties are recognized, black and white galls, the latter being inferior in strength. Tannic acid is present in about 60 per cent., gallic acid 3 per cent. The preparations are—

Tinctura Gallæ (20 per cent.), dose ʒj–iij.

Unguentum Gallæ (10 per cent.).

Nutgall is not much used internally. It is used as a gargle, and as an enema in chronic dysentery due to ulcerations in the lower end of the large intestine; as an ointment for hemorrhoids and in certain irritable skin lesions, notably urticaria.

KRAMERIA.

What points of interest does it present?

Krameria, or rhatany, is the *root* of *Krameria triandra* and *K. tomentosa*, the cortical portion of which is most efficient. It contains rhatania-tannic acid, and has an astringent, slightly bitter, and sweetish taste. The dose of the powder is gr. xx–xxx. Its preparations are—

Trochisci Krameriæ, each containing gr. j.
Extractum Krameriæ, dose gr. v–xv.
Extractum Krameriæ Fluidum, dose ♏xx–ʒj.
Syrupus Krameriæ (½ fl. ext.), dose ʒj–iij.
Tinctura Krameriæ (20 per cent.), dose ʒj–ʒss.

It is a favorite remedy in diarrhœa, especially the summer diarrhœa of children, and in dysentery, intestinal hemorrhages, etc.: it is administered by mouth, or, when the lesion is in the lower intestinal tract, by enema.

CATECHU.

Give its source, composition, and uses?

Catechu is an extract from the *wood* of *Acacia catechu*, a small East Indian tree. It is *composed* of *catechu-tannic acid* 50 per cent., catechin, an extractive, 30 per cent., and other ingredients. Its uses are those of krameria, but it is more powerful from its larger percentage of tannic acid; also used as an urethral injection in chronic urethritis. Like krameria, it is often employed in combination with other measures. Its officinal preparations are—

Catechu (powdered), dose gr. x–ʒss.
Trochisci Catechu, in each gr. j.
Tinctura Catechu Composita (contains cinnamon), dose ʒss-ij.

KINO.

What are its principal features?

Kino is the inspissated *juice* of *Pterocarpus marsupium*, an East Indian tree. It occurs in brittle, reddish-brown fragments, breaking in angular forms, and having a very astringent taste. It contains *kino-tannic acid*. Tinctura Kino (10 per cent.) is officinal, dose ʒj–ij. Of the powder the dose is gr. x–xxx. It is a favorite remedy in intestinal hemorrhages and fluxes, and is employed as an injection in leucorrhœa, gonorrhœa, and gleet.

HÆMATOXYLON.

What is hæmatoxylon?

This drug, known also as logwood or Campeachy-wood, is the *heart-wood* of *Hæmatoxylon campechianum*, a tree of tropical America. It contains tannic acid, hæmatoxylin, hæmatein, which is used as a dye, etc. It is used for the same purposes as its sister remedies. The red

color imparted to the stools may arouse suspicions of hemorrhage. It is particularly advocated in cholera infantum and the diarrhœa of phthisis (Biddle). It has an officinal extract, given in gr. x–xxx doses.

GERANIUM.

What are its source, composition, uses, and preparations?

Geranium, crowsfoot or cranesbill, is the *rhizome* of *Geranium maculatum*, an indigenous plant, containing tannic and gallic acids, gum, resin, starch, etc. It is an excellent astringent, well borne by the stomach, and can be substituted for the more expensive foreign drugs in any of their uses, as in enema, injection, gargle, or internally. Dose of the powder, gr. xx–xxx; of the fluid extract, ʒss–j.

HAMAMELIS.

What is hamamelis or witch-hazel?

The *leaves* of *Hamamelis virginica*, an indigenous shrub: the bark may also be used. It contains from 8 to 10 per cent. of tannic acid and other principles. It is used as an astringent, and is thought by some to have hæmostatic properties peculiar to itself. It is particularly useful in hemorrhoids, both locally and internally, and to fulfil any indication for tannic acid. It has an officinal fluid extract, dose ʒss–j.

QUERCUS ALBA.

What is quercus alba?

It is the *inner bark* of *Quercus alba*, or white oak, containing quercitannic acid, tannic acid, etc. It is used as an astringent, and fulfils the indications of tannic acid. It has no officinal preparations, and a decoction may be used.

Enumerate other remedies of this class and their preparations.

Rosa Gallica, *petals* of the red rose:
Extractum Rosæ Fluidum, ʒj–ij.
Confectio Rosæ, }
Mel Rosæ, } used as vehicles.
Syrupus Rosæ, }

Rubus, the *bark* of the *root* of *Rubus villosus* and *R. trivialis*, or blackberry. Its officinal syrup is used as a vehicle.

Castanea, chestnut, *leaves* of *Castanea vesca*, said to be an efficient antispasmodic in pertussis.

Rhus Glabra, sumach, *fruit* of *R. glabra*, an indigenous shrub. Extractum Rhois Glabræ Fluidum is only used externally.

Unofficinal vegetable astringents are—

Heuchera, *root* of *H. Americana*, or alum-root.

Statice Limonum, or marsh rosemary.

Nymphæa Odorata, *root* of the sweet water-lily.

These and many others contain tannic acid, and may be used in the form of a decoction.

MINERAL ASTRINGENTS.

What are they?

Mineral astringents are a class of metallic salts having many actions and uses in common, but differing widely in other respects. As astringents their uses correspond to those given above.

ARGENTUM (SILVER).

What are its preparations and their properties?

Metallic silver is inert.

Argenti Iodidum, dose gr. j–ij.

Argenti Nitras, nitrate of silver, an anhydrous salt occurring in colorless rhombic crystals freely soluble in water. It has a metallic, astringent taste, and gives a white precipitate, chloride of silver, with soluble chlorides, dose gr. ¼–½.

Argenti Nitras Fusus, external use.

Argenti Nitras Dilutus, "mitigated stick," equal parts of silver and potassium nitrates; external use.

Argenti Oxidum, a brownish powder only slightly soluble in water; dose gr. j.

Argenti Cyanidum, pharm. use.

What are the incompatibles and antidotes of silver?

Silver salts are incompatible with hydrochloric, sulphuric, tartaric, and sulphurous acids *and their salts;* with alkalies, alkaline carbonates, and astringent solutions. The *antidote* is *common salt* (sodium chloride) in large amounts in *tepid* water, which acts to form the insoluble silver chloride and as an emetic.

What physiological effects are produced locally? What generally?

Locally, the nitrate of silver, which is the preparation most used, is a mild caustic, forming albuminate of silver and limiting its own action.

Nervous System.—In small doses it is a tonic and antispasmodic; in large doses it causes headache, vertigo, loss of memory, nervous depression, etc. by a *centric action*, and hypodermically may paralyze.

Circulation.—Heart not affected; silver salts are absorbed into the blood as an albuminate; the blood-corpuscles, after large doses, are said to be changed in shape and the hæmoglobin to be converted to hæmatin (?). The temperature as a result of these blood-changes is slightly lowered. Small doses increase the secretions of the gastro-intestinal tract and of the liver; large doses or long-continued use causes catarrhal symptoms, and may even result in erosions and ulcers of the stomach.

What is meant by chronic argyria?

This is a term applied to a train of symptoms following the prolonged use of the drug. Owing to its slow elimination by the kidneys and intestines it becomes deposited in the tissues, and when this deposit is exposed to the light, as in the skin or mucous membranes, a slate or bluish color is developed. Parenchymatous or fatty degeneration of the liver and kidneys may also take place. The *treatment* of this condition consists in administering the iodide of potash to cause elimination, in baths of sodium hyposulphite, or in local applications of potassium cyanide. These measures probably will fail. Prophylaxis is important. Never continue the use of silver salts more than six weeks at a time.

What are the therapeutic uses of silver?

These are local and constitutional. Locally, the nitrate is used in *acute tonsillitis* in early stages; a strong solution (ʒss to ℥j) may abort or at least greatly alleviate.

Ulcers of the mucous membranes, as of the mouth, tongue, cervix uteri, and endometrium, whether syphilitic or otherwise, may be benefited by strong solutions or the "stick."

In *indolent ulcers or sinuses* as a stimulating application. In *irritable* ulcers the "stick" forms a protecting pellicle and relieves pain; in *vaginal gonorrhœa* it may be used in strong solutions, but *never* in the male urethra; in *granular urethritis* a deep injection of ♏v to x of a gr. x to ℥j solution may cure; *pruritus vulvæ* is cured by application of a solution (gr. xx to ℥j) to cervix, vagina, or external genitals, depending on the seat of the cause of reflex excitement; in *conjunctivitis* weak solutions (gr. j to ℥j) or the mitigated stick, if of granular variety. There is danger of deposits of silver salts on corneal ulcers, and consequent opacities; hence zinc salts are preferable: *cystic tumors*, *hydrocele*, and *interstitial thyroid tumors* may be cured or diminished by the injection of ♏ij–x of a 20-grain solution, first having withdrawn the fluid, if any.

Internally, nitrate of silver is used in the later stages of *cholera infantum* as an astringent; in the *summer diarrhœa* of children; in *chronic dysentery*, either by mouth or by high enemata (gr. xx–xxx to water Oj); in *chronic diarrhœas*, as of tuberculosis, generally with opium; in *nervous dyspepsia* and *chronic gastritis* in which *gastralgia* and symptoms of fermentation are prominent the oxide is recommended (Bartholow); in *gastric ulcer* the nitrate stimulates healing and relieves pain; in *epilepsy* it is next to the bromides in efficacy, but has to be long continued, and may produce argyria; in *chorea* as an antispasmodic it may improve; the progress of *locomotor ataxia* may apparently be stayed.

CUPRUM (COPPER).

What are its preparations and their properties?

Cupri Acetas, not used internally.

Cupri Sulphas, blue vitriol or blue stone, dose gr. ¼ to v.

Copper Sulphate is obtained by roasting the native sulphide, and occurs as a by-product in silver-refining. It is in the form of prismatic blue crystals, effloresceng slightly and becoming covered by a white powder. It has a styptic taste and is freely soluble in water.

Copper Acetate occurs in bluish-green rhombic prisms, and resembles the sulphate.

What are its antagonists and antidotes?

The alkalies, alkaline carbonates, mineral salts, iodides, and vegetable astringents are incompatible with copper salts. Acute poisoning is rare because of its own emetic action. The antidotes are *albumin* (white of egg, flour, etc.), forming an insoluble albuminate, or *potassium ferrocyanide*, which forms copper ferrocyanide; after the use of either the stomach should be emptied by the stomach-pump or an emetic.

What physiological effects are produced?

Metallic copper is inert. *Locally*, its salts are astringent and mildly caustic to mucous membranes and abraded surfaces.

Nervous System.—In small doses it is a *tonic*, but in large doses causes headache, vertigo, inco-ordination, cramps, stupor, with perhaps convulsions and paralysis.

Circulation.—It probably exists in the blood as an albuminate; large doses are cardiac depressants. Poisonous doses give symptoms of gastro-enteric irritation and collapse—viz. vomiting, abdominal cramps, diarrhœa with greenish or bloody stools (in chronic poisoning it resembles lead, causing cramps and constipation), coldness of skin, rapid and shallow breathing, cardiac depression, and any of the cerebral symptoms mentioned above. *Chronic poisoning* may result from the inhalation of fumes in certain arts or from eating food cooked in copper vessels. The symptoms are those of bronchial or gastro-intestinal irritation, with or without cerebral symptoms.

What are the uses of copper?

Locally, its sulphate may be used in *indolent ulcers* to stimulate granulations; in *granular eyelids* blue stone cures; in *gonorrhœa* after acute stage, as injection, gr. j to ℥j; in *scabies* and *tinea*, as lotion or ointment.

Internally, it is occasionally of service in *chronic diarrhœas* and *dysentery*, gr. $\frac{1}{10}$, combined with opium and gradually increased to gr. ½: very efficient; in vomiting of pregnancy, gr. $\frac{1}{8}$, it acts as an antiemetic. In *neuralgia*, *chorea*, and *epilepsy* it is seldom used now. For its emetic action see *Emetics*.

ZINCUM (ZINC).

Metallic zinc is inert. Its salts act in a way analogous to, but much milder than, copper.

What are its preparations?

Zinci Acetas.
Zinci Carbonas Præcipitatus, pharmacopœial use.
Zinci Chloridum, caustic.
Liquor Zinci Chloridi (50 per cent. chloride).
Zinci Iodidum, dose gr. ss–ij.
Zinci Sulphas (white vitriol), dose gr. j–xx.
Zinci Valerianas, dose gr. j–ij.
Zinci Bromidum and Zinci Phosphidum are considered under *Bromum* and *Phosphorus*, respectively.

With what are zinc salts incompatible? What are the antidotes?

Zinc is incompatible with alkalies and alkaline carbonates, nitrate of silver, and vegetable astringents, all of which precipitate zinc salts. In poisoning, which only occurs after the more powerful salts, the milder being their own emetics, the proper antidotes are albumin, mucilaginous drinks, and opium.

What physiological effects are produced?

The soluble salts (chloride, sulphate, and acetate) are readily absorbed, probably as albuminate, and are more active than the insoluble. Elimination takes place by the secretions of the liver, intestines, and kidneys, and, although slow, is comparatively much more rapid than that of silver, lead, or copper. Locally, they act by coagulating albumin, the chloride being a strong escharotic and disinfecting its own slough, the sulphate acting much more mildly, and solutions of proper strength as mild astringents. Acute poisoning is rare because of emetic action. Chronic poisoning may cause a train of symptoms similar to chronic plumbism—constipation, colic, muscular weakness, or multiple neuritis, but this too is rare.

What therapeutic uses have the zinc salts?

Zinc sulphate is used as an emetic. (See *Emetics.*) It is also used in bronchitis with profuse expectoration as a remote astringent; in nervous disorders, as chorea, epilepsy, etc., as an antispasmodic and nervous tonic, but not so much as formerly. Locally, it is used as an astringent wash or injection in *conjunctivitis*, *otorrhœa*, and *gonorrhœa* in gr. j–vj to ℥j solutions, and as a stimulant to sluggish granulations.

Zinc acetate is used similarly to the sulphate, but weaker.

Zinc chloride is a favorite escharotic for the destruction of lupus, epithelioma, malignant and indolent ulcers, and malignant growths generally. It is commonly used with flour (1 to 3, 4, or 5 parts), and is known as Canquoin's paste.

Zinc oxide is used internally in *gastralgia*, *chronic diarrhœa*, *dysentery*, etc.; in *night-sweats of phthisis* as a remote astringent, gr. j–ij, com-

bined with hyoscyamus or belladonna it is often very effectual; in *spasmodic asthma* and *whooping cough* as an antispasmodic.

Locally, as the officinal ointment or some of its modifications, it is of great value in eczema, erythema, impetigo, herpes, and other skin disorders.

Zinc valerianate has met with success in *hysterical headache*, *cough*, or *aphonia*, and in *neuralgia* which is reflex from pelvic disorder.

PLUMBUM (LEAD).

What are the preparations of lead?

Metallic lead is not officinal. The officinal salts are—

Plumbi Acetas, sugar of lead; most used internally; dose gr. ss–iij.

Liquor Plumbi Subacetatis, Goulard's extract, 25 per cent.

Liquor Plumbi Subacetatis Dilutus, 3 per cent. Liq. Plumb. Subacetat.

Ceratum Plumbi Subacetatis, Goulard's cerate, contains Liq. Plumbi Subacetat. 20 per cent., Ceratum Camphoræ 80 per cent.

Linimentum Plumbi Subacetatis, 40 per cent. in ol. gossypii.

Plumbi Carbonas, white lead, chiefly used in Unguentum Plumbi Carbonatis, which is 10 per cent.

Plumbi Iodidum, dose gr. ss–iij.

Plumbi Nitras, externally only.

Plumbi Oxidum, litharge.

Emplastrum Plumbi Oxidi contains one-third of the oxide in olive oil, and is the basis of most plasters.

Unguentum Diachylon, externally, 60 per cent. of the above.

What salt is most used internally? What are its preparation and properties?

The acetate is most used. It is made by immersing litharge in crude acetic acid. It occurs in colorless efflorescent crystals freely soluble in water.

What are its incompatibles?

The sulphate, carbonate, and iodide of lead are insoluble, and hence are chemically incompatible with solutions of sulphates, carbonates, carbonic acid, or iodides; also incompatible with albumin.

What are the physiological effects of lead?

Locally, the soluble salts act as astringents and irritants and decrease secretions. They are absorbed as albuminates, like other metallic salts, and depress the circulation, lessening the force and frequency of the heart. They *may* act as *remote* astringents as well, checking hemorrhage and decreasing secretions, but this is denied by some authorities.

What are its toxicology and treatment?

Toxic effects may take two forms, *acute* and *chronic*. *Acute* poisoning

is rare, because of self-emesis, but may take place after large doses (℥j+) of the acetate. The symptoms are those of gastro-enteric irritation, with whitish vomiting (chloride) and black purging (sulphide). The proper remedies are the *soluble sulphates* (Epsom or Glauber salts or *alum*) and albumin to precipitate, followed by the use of the stomach-pump.

Chronic poisoning or *chronic plumbism*, on the other hand, is quite common. It may result in various ways—in workers in lead, from water standing in lead pipes, etc.—and may take any of the following forms:

Colica pictonum, or *painter's colic*, the characteristic symptoms of which are *retracted abdomen*, *pains* radiating from the umbilicus and supposed to be due to over-excitation of the intestinal ganglia, *obstinate constipation*, nausea, and vomiting.

Lead arthralgia, a painful condition of the joints, supposed to be caused by deposition of urates in the joints from deficient oxidation.

Lead encephalopathy, a rare form, characterized by delirium, convulsions, coma, and death.

Lead paralysis, a frequent variety of the disease. It is a peripheral neuritis, more often affecting the extensor than the flexor muscles, the upper than the lower extremity ("wrist-drop" or "toe-drop" are caused).

A symptom which may accompany any of these forms of *chronic* poisoning, and is seen especially in uncleanly persons, is a *blue or slate-colored line* along the gums. Death may occur from malnutrition, paralysis of the respiratory muscles, or from coma.

The *treatment* is *prophylactic* and *eliminative*. The former consists in the avoidance of any source of contamination and by directing workers in lead to *carefully clean their hands* before meals. Sulphuric-acid lemonade and albumin (milk) are also to a degree prophylactic. Elimination is effected by the soluble sulphates mentioned above, iodide of potash, and sulphur baths. For the palsy galvanism is indicated, a peculiarity being that voluntary movement lasts longer than electrical excitability, and returns first.

What therapeutic uses has lead acetate?

As mentioned above, lead acetate is almost solely used internally. It has been found useful in *diarrhœa*, *dysentery*, *cholera*, and *yellow fever*, acting by its local astringency; in *bronchitis* and *colliquative sweating*, by virtue of its supposed remote astringency; in *aneurism*, from its combined *sedative* and *astringent* effects; in *hæmatemesis* from gastric ulcer; valuable in *hæmoptysis;* probably one of the best remote hæmostatics.

Locally also the acetate is a favorite, although the oxide and carbonate are used, as in *eczema* and other irritative skin lesions; in *superficial inflammations*, as lead-and-opium wash, which, however, is not to be employed as a collyrium; in *burns* the lead solutions relieve pain, and white lead may be used over small areas.

ALUMEN (ALUM).

What is alum?

The officinal alum is a *double sulphate* of *aluminium* and *potassium*; it is crystalline, slowly efflorescent, and soluble in water: when heated it gives up its water of crytallization and is called "dried" or "burned alum."

What are the preparations of aluminium?

Alumen, the above, or Potash Alum, dose gr. x–ʒss.

Alumen Exsiccatum, dried alum,
Aluminii Hydras,
Aluminii Sulphas,
} external use.

What are the incompatibles of alum?

The alkalies and their carbonates, soluble lead salts, and tannic acid are the principal incompatibles.

What are its physiological effects?

Alum acts locally as an *astringent* by causing coagulation of albumin, and in large doses as a *gastro-intestinal irritant*. It is *slowly* absorbed, and is supposed to act as a remote astringent, causing contraction of the tissues and capillaries.

Of what therapuetic use is alum?

Alum is used as a direct astringent in *hæmatemesis* and *intestinal hemorrhage* due to passive congestion, no active inflammatory process being present; in *chronic dysentery* and *diarrhœa*, generally in combination.

Locally, as an astringent to painful *ulcers*, *hemorrhoids*, or *fissures*; in *conjunctivitis* as alum-whey, etc.; in *night-sweats*, alum baths may check.

For further use see *Emetics*.

It is also believed by some to act as a remote astringent in bronchorrhœa and hæmoptysis, but inhalation of the vapor is preferable. It is a very efficient agent in lead colic, acting as a soluble sulphate and in some unknown way when there is no lead in the intestinal tract.

The acetate of aluminium has recently found favor as a non-irritating antiseptic lotion in superficial inflammatory processes.

TONICS.

FERRUM (IRON).

What are the relations of iron and anæmia?

Iron is an essential element in the hæmoglobin of the red blood-cells, is thus a *food*, and is found to exist in small proportions in most food-products, especially beef. Whenever, from *insufficient* ingestion or as-

similation of iron or from its abnormal discharge or excretion, as in hemorrhage, an insufficiency of this element occurs, a condition of *anæmia* is established. If in a patient in this condition the causes of deterioration be checked and iron be given, a rapid increase in the blood-elements takes place, and the patient returns to a healthy condition. In health its administration probably causes little effect.

What can you say of the absorption, physiological effects, and elimination of iron?

The organic salts are absorbed directly into the blood, the acid radical being burned off (or oxidized), while salts of the mineral acids may be absorbed unchanged. Soluble preparations are probably converted into the chloride by the stomach acids. Iron probably exists in the blood as an albuminate, and is conjectured to act by converting the respired oxygen into ozone, a more efficient form for purposes of oxidation; *i. e.* it is an *adjuvant to the processes of oxidation* in the body. The red blood-disks are increased in number and the hæmoglobin in amount under its use.

Secretions.—Iron preparations are astringent, decreasing the secretions generally, and especially the gastro-intestinal, thus causing constipation, with stools stained black by the sulphide. The *urea*, however, is increased as a result of increased tissue-metamorphosis. It is eliminated by the bile, urine, and fæces, in the last named being probably that which has escaped absorption.

What are the indications for the use of iron?

The main indication for the use of iron is *anæmia*. Many conditions dependent to a greater or less degree on anæmia are greatly benefited by the use of this blood tonic, especially *neuralgia*, *hysteria*, *chorea*, and occasionally *epilepsy*. Iron preparations are also used as *stomachics* and *astringents*: they should be administered on a full stomach.

What are the most important preparations of iron?

The following preparations are important enough to require detailed notice:

Ferrum Redactum (reduced iron), obtained by passing hydrogen gas through ferric hydrate: it is a tasteless, gray powder, insoluble in water, but very soluble in sulphuric acid, and very prone to oxidize; it is a mild chalybeate of very slight astringency, and suitable for prolonged administration in chlorosis, etc.; dose gr. iij–vj.

Ferri Oxidum Hydratum (ferric hydrate), prepared officinally by the reaction of ferric sulphate and ammonium hydrate: when dried it is not used medicinally, but, freshly precipitated as a moist reddish-brown magma, it is an *antidote to arsenic*. Given ad libitum for this purpose.

Ferri Oxidum Hydratum cum Magnesia (ferric hydrate with magnesia): similar to the above preparation, but precipitated by magnesia instead of ammonia. From its slightly purgative action it is preferable as an antidote to arsenic. Dose ʒss or more, frequently repeated.

Ferri Carbonas Saccharatus (saccharated ferrous carbonate), prepared

by the double reaction of ferrous sulphate and sodium bicarbonate in the presence of sugar to prevent oxidation: a valuable preparation, as it retains its ozonizing power; dose gr. v–xxx.

Massa Ferri Carbonatis contains half its weight of ferrous carbonate: prepared as above.

Ferri Sulphas (ferrous sulphate), when impure called *green vitriol* or *copperas:* prepared for medicinal purposes by dissolving iron in dilute sulphuric acid with heat; occurs as greenish-blue crystals of styptic taste, and soluble in water; in the air these effloresce, absorb oxygen, and become pale—viz. *ferric* sulphate is formed; heated, they give up water of crystallization, and the dried sulphate is formed. It is an active chalybeate, but too astringent for continued use. Dose gr. j–v.

Liquor Ferri Tersulphatis (solution of the tersulphate of iron): very styptic; employed to form the hydrate for arsenic-poisoning and locally as an astringent.

Liquor Ferri Subsulphatis (Monsel's solution) is a solution of a basic ferric sulphate. It is useful as an internal astringent in gastric and intestinal hemorrhage (dose ℥v–xv), and topically applied it is one of the best styptics. In dilution it is a valuable application in inflammations of mucous membranes.

Tinctura Ferri Chloridi (tincture of ferric chloride) is one of the most efficient iron salts, having a marked styptic taste and astringent effect, and in large doses causing irritation. It contains an ether to which it probably owes its slightly *diuretic effect* and its specific astringent effect on the genito-urinary tract. It is used with good effect in *erysipelas*, and has its advocates in *diphtheria* and *scarlet fever*. As it is particularly destructive to the teeth, care should be taken in prescribing it. Dose gtt. xv–xxx.

Mistura Ferri et Ammonii Acetatis (Basham's mixture) is said to be very valuable in the anæmia of chronic nephritis.

Syrupus Ferri Iodidi (syrup of the iodide of iron) is a transparent, pale-green liquid, combining the effects of iodine and iron, not constipating, and is a standard remedy in scrofulous or tuberculous conditions, especially in children; dose gtt. x–xxx.

Ferri et Potassii Tartras (iron and potassium tartras) occurs as transparent red crystals, wholly soluble in water, prepared by the addition of ferric hydrate to potassium bitartrate. Like the preceding preparation, it is non-constipating, which, with its agreeable flavor and its compatibility with alkalies, renders it valuable for children.

Ferri Pyrophosphas (ferric pyrophosphate); greenish scales, freely soluble in water: a valuable chalybeate; dose gr. ij–x.

Ferri Hypophosphis: supposed by some to be especially valuable in nervous lesions, generally in combination with other hypophosphites; dose gr. x–xxx.

Liquor Ferri Nitratis: in addition to its tonic action this is a good astringent, and as such is employed in intestinal and other fluxes when associated with anæmia.

Syrupus Ferri Bromidi (syrup of ferrous bromide) combines the action of iron and bromide, and is especially indicated in chorea with anæmia.

Ferri et Quininæ Citras (citrate of iron and quinine): a valuable tonic, combining the effects of its two components; dose gr. v–x.

Vinum Ferri Amarum contains the above as its active ingredient, and is a good bitter tonic; dose ʒj–ij.

Ferri et Ammonii Citras has antacid properties.

Ferri et Ammonii Sulphas (ammonio-ferric alum): used in chronic diarrhœa and dysentery for astringent effect.

Ferrum Dialyzatum, a recently introduced and very valuable chalybeate: formed by the dialysis of a solution of ferric chloride. Its exact composition is unknown. It should not be used in combination. It is only slightly constipating, and is a good antidote for arsenic. Dose gtt. x to xx, followed by sodium chloride to ensure its absorption.

Other preparations of iron, all possessing tonic properties, are very numerous, but the foregoing seem ample for our purpose.

MANGANUM (MANGANESE).

What is manganese?

The metal manganese is a normal constituent of the body, the blood, hair, etc., existing in minute portions, and has tonic properties when administered alone or in combination with iron in conditions of anæmia and cachexia, but is inferior to iron.

In what forms is it officinal?

Mangani Oxidum Nigrum (black oxide or binoxide of manganese): grayish-black, amorphous, or crystalline powder, odorless, tasteless, and insoluble in water; dose gr. j–v.

Mangani Sulphas (manganese sulphate); transparent, slightly rose-colored crystals, odorless, with a slightly styptic taste and soluble in water; dose gr. j–iij.

What are its uses?

These salts are used as above indicated, as a succedaneum to iron. By some they are regarded as resembling bismuth, and are given in *gastrodynia* and *pyrosis:* others attribute to them emmenagogue properties. The sulphate is thought to be cholagogue, and has been given in *jaundice* due to inflammation of the bile-ducts. Potassium permanganate is an antiseptic.

ACIDUM SULPHURICUM (SULPHURIC ACID).

What preparations are officinal?

Acidum Sulphuricum (oil of vitriol) contains 96 per cent. of the absolute acid; is used externally as a caustic.

Acidum Sulphuricum Dilutum: 10 per cent. strength in water; dose ♏x–xxx: it is inferior medicinally to

Acidum Sulphuricum Aromaticum, which is of 20 per cent. strength, with alcohol 7 per cent., and tinct. zingiberis and oil of cinnamon.

What effects does it produce?

Sulphuric acid is a powerful penetrating caustic, abstracting the water from the tissues by its powerful affinity therefor, and carbonizing (blackening) the flesh. Therapeutic doses of its weaker preparations are absorbed as sulphate, and eliminated in that form by the kidneys, intestinal tract, and skin, upon which tissues it exerts an astringent effect.

What are its uses therapeutically?

Locally, strong sulphuric acid is still somewhat used as a caustic in a paste with asbestos or charcoal in the treatment of *chancroidal* and other *ulcerations*. Diluted, and preferably as acid. sulphuric. aromat., it is used in *diarrhœas*, especially the profuse watery forms, and also in *cholera* and *cholera infantum;* also in the colliquative sweating of debilitated conditions; in hemorrhages as a *remote* astringent, probably ineffective; in lead-poisoning, in the acute form of which it is an efficient antidote, forming the insoluble lead sulphate; in chronic plumbism its efficacy is doubtful, but in the form of sulphuric-acid lemonade it may prove a prophylactic; as a solvent for cinchona salts.

In administering sulphuric acid care should be taken of the teeth, and it should be *well diluted*, for even the weaker preparations are irritating.

What are the symptoms of toxic doses?

After a poisonous dose of the strong acid we have two stages: immediately pain in the œsophagus, throat, and epigastrium are experienced, followed by violent vomiting, often of tarry matter, with symptoms of severe collapse, death ensuing in from two to ten hours. If the patient survives this stage he suffers subsequently from ulcerations of the pharynx, larynx, œsophagus, and stomach, the parotids become inflamed from occlusion of Steno's duct, and an acute parenchymatous nephritis may develop.

What are the diagnosis and treatment?

The *blackened* slough makes the diagnosis. The treatment of the acute condition consists in the administration of the salts of magnesium and calcium or of the alkaline carbonates. Whitewash or soap may be the most available. The antidotes should be given freely in milk, water, or other diluent. Subsequent treatment is according to the nature of the sequelæ.

ACIDUM HYDROCHLORICUM (HYDROCHLORIC ACID).

In what forms is it officinal?

Acidum Hydrochloricum, 32 per cent. of gas; not much used medicinally; dose ♏v–x, well diluted.

Acidum Hydrochloricum Dilutum, 10 per cent. of gas; preferable form for stomach administration.

What are its effects and uses?

This drug exhibits neither pronounced caustic nor astringent effects. Being a normal stomach acid, and having a stimulating effect on the intestinal glandular system, its administration aids digestion by prolonging the action of the pepsin ferment. Thus it is useful in gastric dyspepsia, and as the normal acidity of the stomach is not developed until at least half an hour after the ingestion of food, it should be given at a corresponding time, often in combination with pepsin. In intestinal dyspepsia combinations with nux vomica or some aromatic stomachic are valuable. These are the principal uses of this acid. The toxicology and treatment are the same as for other mineral acids.

ACIDUM NITRICUM (NITRIC ACID).

In what forms is it used?

Acidum Nitricum contains about 70 per cent. of the absolute acid; at first colorless, it changes on exposure to light to a yellowish color; external use only.

Acidum Nitricum Dilutum, 16 per cent. strength, dose ♏xv–℥j.

What effects does it produce?

Locally, in strong solutions, nitric acid is a powerful chemical caustic, in weaker solutions an astringent stimulant. Internally, in considerable dilution, it stimulates the intestinal glandular apparatus, and has a local astringent effect, checking watery discharges. It is absorbed as the nitrate, but its method of elimination is unknown.

What are its uses?

Locally, it is used as a caustic in chancres, venereal warts, etc., care being taken to protect the surrounding healthy tissues with vaseline, and to limit its action, when sufficient, by an alkaline lotion. Also used as caustic in cancrum oris and other phagedænic conditions. Internally, nitric acid is used in *dyspepsia*, especially of the intestinal type, with *torpidity of the liver;* and in *serous diarrhœas*, in which Hope's camphor mixture is a good prescription.

What is its toxicology?

Nitric acid is a very powerful corrosive poison, causing deep, *yellow* sloughs, which are diagnostic. The symptoms and treatment are those of other mineral acids.

ACIDUM NITRO-HYDROCHLORICUM.

What is nitro-hydrochloric acid?

This acid combination, known also as nitro-muriatic, consists of nitric acid 4 and hydrochloric acid 15 parts, forming an orange-colored, chlorine-

evolving liquid, which changes on standing to a yellow color, in which condition it is directed to be used; dose ♏iij–v, well diluted.

Acidum Nitro-hydrochloricum Dilutum contains the same amounts of the component acids, with water to 100 parts, and is thus about 20 per cent. strength; dose ♏xx–xxx.

What are its physiological effects?

The history of the drug after ingestion is not clear. Like the acids of which it is composed, it seems to be an intestinal glandular stimulant, with a special action on the hepatic secretion.

What are its medicinal uses?

This acid is used in *intestinal dyspepsia* with hepatic congestion, the so-called "bilious" condition, and is very efficacious; in *chronic diarrhœa*, especially in those cases due to imperfect digestion, with consequent irritations from undigested or fermenting food, acting by aiding digestion; also in *syphilitic dyscrasia* and certain chronic skin diseases, in which it accomplishes good in the same manner.

Locally, as baths (℥iij–℥v to Cij of water) or as a local application to the region of the liver (℥j–iij to the pint) it is claimed to do good in chronic diseases of the liver, as cirrhosis, fatty liver, etc. Toxicology same as for other members of this group.

ACIDUM LACTICUM.

What preparations are officinal?

Acidum Lacticum, 75 per cent. of absolute acid, dose ♏v–xv.

Acidum Lacticum Dilutum, dose ♏xx–xl.

What are its effects and uses?

It exists as a normal acid in stomach digestion, and may be administered as an aid to the pepsin ferment in dyspepsia.

PHOSPHORUS.

What are its chemical properties?

Phosphorus is a non-metallic element, solid at ordinary temperatures, *igniting* at 100° F. and melting at 108° F. It is translucent, colorless when pure (generally slightly yellow), and has a peculiar garlicky odor. It is obtained from bone-ash (calcium phosphate) by removing the lime by sulphuric acid and dehydrating the residuum with charcoal. It is insoluble in water, only slightly soluble in oils, ether, and alcohol, and freely so in chloroform.

What preparations have phosphorus effects?

Phosphorus, never given in substance, dose gr. $\frac{1}{100}$–$\frac{1}{80}$.

Oleum Phosphoratum, 1 per cent. in ether and expressed oil of almonds, dose ♏j–iij.

Pilulae Phosphori, each contains gr. $\frac{1}{100}$.

Zinci Phosphidum, dose gr. $\frac{1}{20}$—$\frac{1}{10}$.

Thompson's Solution of Phosphorus is not officinal, but is much used—℥j = gr. $\frac{1}{20}$; dose accordingly.

The various hypophosphites do not have the effects of phosphorus, and are considered later.

What are the effects of phosphorus?

Locally, this drug is an irritant, producing inflammation, ulceration, and even gangrene. Constant inhalation by workmen having carious teeth may cause necrosis of the lower jaw. When taken internally it varies decidedly in its effects with the size of the dose. Medicinal doses stimulate the nervous system and act as a tonic thereto, repairing waste; stimulate the circulation; elevate and then slightly lower the temperature; and have a direct effect on bone-formation. Phosphorus is absorbed in its own form, and is eliminated by the liver and general glandular system.

What are the effects of toxic doses?

The symptoms *develop tardily* in from three to twelve hours. They are—general wretchedness, vomiting, at first of food, and bile with alliaceous odor and luminous in the dark, later perhaps coffee-colored from exuded blood; purging (the stools also being phosphorescent) and abdominal pain; *jaundice* of the non-obstructive variety develops on the second day. Later, pronounced nervous disturbances occur—headache, giddiness, sleeplessness, somnolence, and coma: when these are marked a fatal termination may be expected. The urine is generally scanty and albuminous, and may contain glucose; when jaundice comes on it reacts to the biliary acids and coloring matters. Death generally occurs not earlier than the second day, and may be postponed much longer; it has resulted from gr. jss.

What pathological changes occur in poisoning?

The *liver* is enlarged, friable, and pale, with fatty degeneration of its parenchyma, followed in protracted cases by atrophy. The *gastro-intestinal mucous* membrane is swollen, opaque, and light-colored from a general adenitis, but is seldom eroded. The *kidneys* undergo changes analogous to those of the liver. The *blood* becomes dark, loses its power of coagulation, and ecchymoses occur in all parts of the body.

Diagnosis of phosphorus-poisoning.

The train of symptoms so closely resembles those of acute yellow atrophy of the liver that it may be impossible to differentiate. Phosphorescence of the breath, vomited matter, and stools, and the primary enlargement of the liver may aid in diagnosis.

How would you treat phosphorus-poisoning?

Avoid all fatty substances, which dissolve phosphorus and aid in its

absorption; give *sulphate of copper* as emetic, for it is also a chemical antidote by forming a black copper phosphide; after thorough emesis the same drug may be given in small doses combined with opium as an *antidote* merely; then give *old French* or *acid oil of turpentine*, which contains *oxygen*, the essential antidote.

Of what therapeutic use is phosphorus?

Three classes of diseases call for the use of phosphorus—viz. diseases of bone-formation, of the nerves, and chronic affections of the superficial layers of the skin. Thus it is used in rickets and osteomalacia with markedly good results, generally in combination with iron; in nervous exhaustion, neuralgia, cerebral softening, and myelitis it is used with advantage; in acne indurata, psoriasis, the furuncular diathesis, and lupus it is a valuable succedaneum to arsenic.

Points in its administration.

The officinal oil of turpentine, being already in solution, is readily absorbed, and should be used with care. The phosphide of zinc acts as a phosphorus compound, and although it is one-fourth phosphorus, only one-half of this is available. Hence the dose is eight times that of phosphorus (gr. $\frac{1}{20}$–$\frac{1}{12}$), although Prof. Seguin gives as high as gr. $\frac{1}{8}$–$\frac{1}{4}$.

ALTERATIVES.

What are alteratives?

This term has been applied to a class of drugs which have been found empirically to have a slow but certain effect in certain diseases or diatheses, the rationale of their action being unknown. Their immediate effects in ordinary doses are slight, but in large or continued dosage they may depress very decidedly the nutrition and general condition of the body.

ACIDUM ARSENIOSUM (ARSENIOUS ACID).

What are its properties?

Arsenic, or arsenious acid, when first sublimed from its ores occurs in glassy, colorless, transparent masses, which on keeping become milky-white externally. It is soluble in water, has a faintly sweetish taste, and volatilizes without fusing at a temperature of 400° F. or less. It is also called *arsenious oxide* or *white arsenic*.

What are its preparations?

The metal arsencium is not officinal. The following are:
Acidum Arseniosum, dose gr. $\frac{1}{50}$–$\frac{1}{2}$.
Liquor Acidi Arseniosi (1 per cent.), dose ♏ij–viij.
Arsenii Iodidum, dose gr. $\frac{1}{30}$–$\frac{1}{10}$.
Sodii Arsenias, dose gr. $\frac{1}{12}$–$\frac{1}{3}$.

Liquor Sodii Arseniatis (1 per cent.), erroneously called Pearson's solution, which is about gr. j to ʒj; dose ♏ij–x.

Liquor Potassii Arsenitis (Fowler's solution) contains of arsenious acid and sod. bicarb. 1 per cent. of each, and of tinct. lavand. comp. to color, 3 per cent. Is most used. Dose ♏ij–viij.

Liquor Arsenii et Hydrargyri Iodidi (Donovan's solution) contains 1 per cent. each of arsenious iodide and the red iodide of mercury; dose ♏v–x.

What are its effects in therapeutic doses?

In moderate doses arsenic *stimulates digestion* and *promotes nutrition*. Aside from this, its effects are not obvious unless long continued, in which case dryness of the throat, nausea, perhaps diarrhœa, conjunctival and nasal irritation, and a peculiar facial œdema, especially noticeable beneath the eyes, may develop. The last is a signal for suspending the administration of the drug. This selective action on the mucous membranes takes place, however the drug be administered. If continued longer or in too large medicinal doses, a chronic poisoning with exaggeration of the symptoms supervenes, and digestive disorders, conjunctivitis, œdema, cutaneous eruptions with falling of the nails and hair, and local paralyses, may result.

What are the symptoms, pathology, and treatment of arsenical poisoning?

The symptoms develop in from fifteen minutes to one hour: they are faucial constriction, burning pain in the œsophagus and stomach, succeeded by violent *spasmodic* abdominal pain and persistent vomiting; purging, the stools at first bilious, but later serous, with mucoid flakes and sometimes blood, excessive thirst, and suppression of urine, soon follow; then ensue collapse, with small feeble and rapid pulse, embarrassed breathing, coldness of the extremities and cyanosis, and finally death, preceded by coma. In some cases a remission of these symptoms occurs, but the urinary symptoms continue, and the above symptoms are again developed, with pronounced nervous symptoms, tremblings, cramps, and convulsions, skin eruptions, and finally a fatal termination in from two to six days.

Sequelæ.—In cases which recover there may be developed (1) inflammatory conditions of the alimentary tract in any part; (2) a widespread multiple neuritis, the muscles presenting the reaction of degeneration and various sensory disturbances occurring; (3) in some cases perhaps an actual lesion of the spinal cord (poliomyelitis): the affected muscles generally recover.

Lesions.—At the autopsy the *gastro-intestinal mucous membrane* is found swollen, congested, and in places covered by a plastic exudation, and, as the contents of the intestinal tract, a fluid resembling the discharges of cholera; actual *fatty degeneration of the liver, spleen, and*

kidneys; in some cases congestion of the broncho-pulmonary mucous membrane has been noted. The *tissues*, and especially the nervous organs, are found to *contain arsenic.* (Indeed, during life, after elimination of the drug has ceased, the administration of potassium iodide will cause it to reappear in the secretions.) This storing of the drug in the tissues is true however administered, and diffusion may take place *post-mortem.*

Treatment.—In recent cases immediate evacuation of the stomach, preferably by the stomach-pump, is indicated. One of the following antidotes should then be freely administered: (1) *Freshly-precipitated ferric hydrate* (*q. v.*), which forms an insoluble arseniate of iron; (2) ferri oxidum hydratum cum magnesia; (3) dialyzed iron, followed by common salt or some alkali. Demulcent drinks, opiates, and stimulants, *p. r. n.*, complete the treatment.

What therapeutic uses has arsenic?

Locally, arsenious acid is a powerful caustic, and is used as such, either pure or mixed in varying proportions with sulphur, in the treatment of lupus, indolent sinuses, etc. The danger of absorption is said to be less when freely applied. Internally, it is much used in certain nervous conditions, as *chorea, migraine,* and *neuralgia;* in chronic diseases of the superficial layers of the skin, as psoriasis, pityriasis, pemphigus, and certain chronic forms of eczema, but *never until all acute symptoms are past;* in *irritative dyspepsias, gastric ulcer,* etc. *small doses* (m̃j–ij of Fowler's solution) *before meals* may relieve the symptoms and promote digestion; *anæmias,* and especially the *pernicious form,* may be greatly benefited—best combined with iron; in *malarial poisoning* not yielding to quinine, and not in the acute stage, but only when paroxysms have ceased or become infrequent: it should be given in large doses; *multiple lymphadenomata* and other glandular swellings have been known to recover under its use.

What is its administration?

The dosage will depend, as has been seen above, upon the condition to be reached. Thus, malarial poisoning and glandular enlargements will require considerable doses, while only small ones will be tolerated in certain gastric conditions. The liq. sod. arseniat is said to be less irritating to the stomach, but Fowler's solution or the acid itself is the form most used. Donovan's solution will receive notice under Mercurial Preparations.

HYDRARGYRUM (MERCURY).

What is mercury?

Mercury, or quicksilver, is a volatile metal, liquid above —40° F., exceedingly heavy, but otherwise of negative properties. It is obtained from its native sulphide or cinnabar.

What preparations are in general use?

Massa Hydrargyri (blue mass), one-third metallic mercury; dose gr. j–x.

Hydrargyrum cum Creta (gray powder) contains mercury 38 parts, creta præparata 50, and lactose to 100; dose gr. v–ʒss.

Unguentum Hydrargyri (blue ointment), 50 per cent. mercury.

Emplastrum Hydrarg. and Emplastrum Ammoniaci c. Hydrargyro are unimportant.

Hydrargyri Chloridum Mite (calomel), dose gr. ss–xv. Calomel is an ingredient of the compound cathartic pill. Black wash (lotio nigra) is made by adding calomel ʒj to lime-water Oj, the black oxide being formed.

Hydrargyri Chloridum Corrosivum (corrosive sublimate), dose gr. $\frac{1}{32}$–$\frac{1}{8}$. In yellow wash (lotio flava) we have the yellow oxide of mercury, formed by adding ʒss of corrosive sublimate to Oj of lime-water.

Hydrargyrum Ammoniatum (white precipitate) is contained in Unguentum Hydrargyri Ammoniati, 10 per cent.

Hydrargyri Cyanidum, dose gr. $\frac{1}{30}$–$\frac{1}{8}$.

Hydrargyri Iodidum Rubrum, dose gr. $\frac{1}{32}$–$\frac{1}{4}$.

Liquor Hydrargyri et Arsenii Iodidum (Donovan's solution).

Hydrargyri Iodidum Viride, dose gr. $\frac{1}{4}$–j.

Liquor Hydrargyri Nitratis, a caustic.

Unguentum Hydrargyri Nitratis, citrine ointment.

Hydrargyri Oxidum Flavum (yellow precipitate) is an ingredient of Unguentum Hydrargyri Oxidi Flavi, 10 per cent., and of Oleatum Hydrargyri, 10 per cent.—a very useful preparation.

Hydrargyri Oxidum Rubrum (red precipitate), used only in Unguentum Hydrargyri Oxidi Rubri, a 10 per cent. ointment.

Hydrargyri Sulphidum Rubrum is cinnabar, dose ʒss.

Hydrargyri Subsulphas Flavus (turpeth mineral) is an emetic. See *Emetics.*

What are its physiological effects?

Mercury in its liquid state is inert, but workmen exposed to its vapors may develop salivation or mercurial palsy. Its compounds, however, are all active, and when locally applied produce effects varying from a very slight irritation to a violent causticity. Internally, single small doses cause very few symptoms beyond a slight stimulation of the secretions generally. Larger medicinal doses, continued, cause a train of symptoms called *salivation.* The milder symptoms are tenderness and tumefaction of the gums, which bleed on the slightest abrasion; soreness of the entire mouth, swelling of the tongue, and greatly increased secretion of the salivary and buccal glands, with a peculiarly fœtid breath and strong metallic taste in the mouth. Swelling and inflammation of the salivary glands, a deep-red line along the gums, and in extreme cases falling of the teeth and necrosis of the maxillæ, may occur. Added to

this we may have a low fever, *diarrhœa*, neuralgia, nervous disorders, and a generally debilitated condition. The blood undergoes decided changes, its power of coagulation being lessened by a diminution of its fibrin and other solid portions. The nutrition of the body is lowered by large doses, but small ones probably have a tonic effect, at least in certain dyscrasiæ.

Workers in mercury after long-continued inhalation of its vapor may become the victims of a *mercurial tremor* simulating paralysis agitans, or of a spasmodic condition resembling *chorea*. Other nervous symptoms often accompany this, as loss of memory, vertigo, and at times local paralysis, probably due to a peripheral neuritis.

The cathartic, emetic, and antiseptic effects of mercurial preparations will be considered under their respective headings.

Elimination.—Mercury has been found in all the tissues and secretions. After its spontaneous elimination has ceased it may be renewed by the administration of potassium iodide, showing that it is stored somewhere in the tissues.

What are its therapeutic uses?

We will consider here the antiphlogistic and antisyphilitic uses of the drug, leaving until later its other uses. By decreasing the fibrinous elements of the blood, mercury may be useful in lessening plastic exudate in inflammations of the serous membranes, as *pleurisy*, *peritonitis*, *pericarditis*, and *iritis*. Its value in endocarditis and pneumonia is less certain. The pseudo-membranous forms of laryngitis are especially benefited. For this antiphlogistic effect it should be administered during the stage of exudation, and it is valueless in subacute inflammations. Calomel and the mass are the favorite forms. In *syphilis* its action is specific, and its administration should be begun at the earliest possible diagnosis, and continued during the secondary stage in dosage just sufficient to maintain a mild influence on the system. In the *tertiary lesions* it is indicated in combination with iodide of potash when an immediate effect is required on local lesions, as those of the brain or liver, which threaten life. Otherwise the iodide is used alone by most authorities. In the cachexia of syphilis it has been proven to increase the number of red blood-cells. As an antisyphilitic remedy mercury is employed in various ways—by mouth in the form of calomel or blue mass, by inunctions of the oleate or ointment, by fumigations of calomel, cinnabar, or the black oxide. In the later lesions the bichloride and the iodides are supposed to be especially efficacious as adjuvants to the iodide of potash.

IODUM (IODINE).

What are the properties of iodine?

Iodine is a soft, friable substance, somewhat volatile at ordinary temperatures, of a chlorinous odor, melting at 225° F., with the emission of a beautiful violet vapor. It is soluble in glycerin, alcohol, and ether, but practically insoluble in water.

What are the effects of continued and toxic doses?

Locally, it is a powerful irritant, and even a mild caustic. The tincture stains the skin, causes a brief smarting sensation, and finally desquamation. Medicinal doses produce a sensation of heat in the epigastrium, a general increase of the secretions, with an especially marked effect on the mucous secretion of the respiratory tract and that of the salivary glands. If too long continued it gives rise to a train of symptoms known as *iodism*, as subacute gastro-enteritis, headache, giddiness, and other evidences of cerebro-spinal disorder, *coryza*, *sore throat*, *frontal headache*, salivation, a skin eruption, generally of *acne*, and sometimes atrophy of the mammæ or testes. The circulatory effects are feeble, but it probably lessens vascular spasm, although perhaps not to a sufficient degree to render it of therapeutic importance.

Taken in *toxic doses*, it produces the symptoms of violent gastro-enteric poisoning, with profound collapse and sometimes convulsions. Its injection into cavities has given rise to severe symptoms. Gr. xx are said to have caused death, while ʒij have been recovered from. The antidote is starch in any available form.

How is iodine absorbed and eliminated?

Iodine is readily absorbed, exists in the blood as sodium iodide, and is eliminated principally by the kidneys, but also in other secretions.

What therapeutic uses has iodine?

Iodine is seldom used alone internally. With the iodide of potassium, as in Lugol's solution, it is employed as a *resolvent* in thyroid enlargements and scrofula, in the latter of which, combined with iron and cod-liver oil, it is considered especially beneficial; as an *alterative* in secondary and tertiary syphilis, but it is inferior to its potassium salt.

Topically, the tinctures are favorite applications in glandular hypertrophy, parasitic skin diseases, chronic painful joint affections, and as a counter-irritant in pleuritic and other pains. Deep injections have been employed with gratifying results in bronchocele, hydrocele, after aspiration of the contents with the purpose of producing adhesive inflammation, and by some in phthisical cavities.

POTASSII IODIDUM (IODIDE OF POTASSIUM).

What are its chemical and physical properties?

Potassium iodide is prepared by the addition of an excess of iodine to an aqueous solution of potassa, and the subsequent conversion of a contaminating potassium iodate into potassium iodide by heating with charcoal. It is a white anhydrous salt, rather deliquescent in moist air, *soluble grain for minim in water*, and soluble also in alcohol. Its aqueous solution dissolves iodine. (See *Lugol's Solution*, below.)

What are its effects and uses?

Its physiological effects are analogous to, but less energetic than, those of iodine. Locally, it is an irritant, and in large doses may cause gastro-intestinal irritation; it increases the secretions, with the exception of that of the mammæ, which it decreases. It is used in *rheumatism*, the *subacute* and *muscular* varieties being especially benefited by it, while in gout and rheumatoid arthritis it may be tried; in neuralgias, especially the sciatic variety, which may be cured; in *asthma*, given between the paroxysms, it seems to prevent their recurrence in some cases; in *chronic inflammations* with *serous accumulations*, as chronic pleurisy or pericarditis, it appears to promote absorption; in *aneurism* it has a good reputation, but, being only slightly sedative to the circulation, its method of action is not clear; in *chronic metallic poisoning*, especially by *lead* or *mercury*, it is very efficient, forming *soluble* double salts with the metal deposited in the tissues, and thus aiding in their elimination. In the latter, if not used with care, it may cause serious salivation; in *tertiary syphilis*, as in the osseous, visceral, or nervous lesions of that disease, it is our main reliance.

It is also used as an antidote to poisoning by the alkaloids, with which it forms insoluble precipitates.

How is potassium iodide best administered?

The ordinary dose is gr. x three times daily, to be gradually increased, but in lesions liable to cause fatal results, as in gummata of the brain or liver, much larger doses are given, up to ℥j–ij per diem. The *saturated solution*, which is practically grain for minim, is a convenient method for administering and increasing the dose. Given in milk or accompanied by small doses of Fowler's solution, it is less apt to cause acne, which is sometimes an unpleasant symptom.

What are the preparations of iodine?

Iodum.

Unguentum Iodi, 4 per cent.

Ammonii Iodidum, dose gr. iij–x.

Sodii Iodidum, dose gr. v–xxx.

Potassii Iodidum, dose gr. x–xxx or more.

Unguentum Potassii Iodidi, 12 per cent.

Liquor Iodi Compositus (Lugol's solution) contains iodine 5 and potassium iodide 10 parts in 100; dose ♏v–xv.

Tinctura Iodi, 8 per cent., chiefly for external use.

Syrupus Acidi Hydriodici, 1 per cent. of the acid, dose ♏xx–xl.

The iodides of zinc, silver, arsenic, and lead are officinal, and have been mentioned under the corresponding metals.

Compare the other iodides with that of potassium.

Hydriodic acid and the iodides of sodium and ammonium produce effects similar to potassium iodide, and may be substituted for it, but

they probably have no advantages, and the ammonium salt is more irritating.

IODOFORMUM (IODOFORM).

What is it?

Iodoform (formyl teriodide, CHI_3) occurs in yellowish scaly crystals, of disagreeable odor, insoluble in water, but freely soluble in alcohol, ether, chloroform, and oils. It contains 96 per cent. of iodine.

What are its physiological effects?

Topically, in powder or in strong solution, it produces considerable anæsthesia. It is readily absorbed from wounds, less readily from the gastro-intestinal tract. Large doses are *depressant to the nervous, circulatory, and respiratory functions.* It is supposed to owe its activity to a liberation of iodine in the tissues. Elimination takes place slowly, for the most part in the urine.

What can you say about its toxicology?

When too freely applied to a large abraded surface poisoning may result. A variety of types of poisoning are recognized, as first pointed out by Schede. They are as follows: (1) febrile type; (2) characterized by fever with gastro-intestinal irritations; (3) profound circulatory depression; (4) the same with fever; (5) immediate collapse and death; (6) meningeal type. Care should be taken not to confound this condition with delirium tremens. The treatment consists in the immediate withdrawal of the drug, and stimulating and sustaining measures generally.

What are its uses?

Iodoform is not much used internally. Locally, in surgical conditions, it has made itself indispensable, acting as an *anæsthetic, stimulant*, and *antiseptic.* The explanation of its efficacy in the latter direction is not clear, but probably it is only of value when decomposed by the ptomaïnes developed by the micro-organisms. In its own form it is *not* a germicide. It is used in all varieties of ulcers, especially if painful, in surgical wounds, and in painful rectal conditions, in gr. v–x suppositories: in tubercular conditions, such as tubercular laryngeal ulcers, its topical use is of value, while in cold abscesses its injection may prove curative. It is further used in a variety of surgical conditions too numerous to mention here. It has an officinal ointment.

IODOLUM (IODOL).

What can you say about iodol?

Iodol is a brownish crystalline powder, resembling iodoform in its solubility, but differing from it in being odorless and tasteless. Its iodine percentage is stated by various authors at from 85 to 90 per cent. *It is more slowly* absorbed than iodoform, and hence less liable to cause

poisoning. It may be used locally as a pleasant substitute for this drug.

ARISTOL.

What is aristol?

Aristol contains 45.8 per cent. of iodine: chemically it is dithymol-diodide; not a germicide: it is non-irritating, and has been used locally in inflammations of the nose and upper air-passages, and in psoriasis, lupus, and syphilitic skin lesions. Its value is still *sub judice.*

OLEUM MORRHUÆ (COD-LIVER OIL).

What are its source and composition?

Cod-liver oil is obtained from the liver of the *Gadus morrhuæ* (common cod) and other species of Gadus. The "shore oil" as used in medicine is a yellow, thick oil, not rancid, and of a peculiar and to most people disagreeable odor and taste. Its composition is quite complex, the most important constituents being *fatty acids, several biliary principles, gaduin* (which is not an active principle), and traces of *iodine, bromine, phosphorus,* and other substances. By the addition of ammonia, trimethylamine is formed. (See *Ergot.*) Cod-liver oil is soluble in ether, chloroform, and glycerin.

What are its physiological effects?

Like other fats, cod-liver oil is absorbed by the small intestine and acts as a nutrient, producing an increase of the body-weight; its biliary ingredients probably aid in its absorption, but its effects are greater than those of other fats, and its complex nature probably gives it some *alterative powers.* Like other fats, it is difficult of digestion, and if the absorptive powers be overtaxed it may cause diarrhœa and other symptoms of digestive disorder.

What are its therapeutic uses?

Cod-liver oil is looked upon as the most useful agent at hand in the treatment of *tuberculous* and *scrofulous* conditions. In the early stages of pulmonary tuberculosis it is an essential, and in some cases apparently curative, element of treatment. In all tuberculous manifestations, whether glandular, osseous, articular, or ulcerative, it is of value, but less so the more advanced the case and the older the patient. In conditions of *anæmia* or defective nutrition it is serviceable, especially in children; thus in *rickets* this drug is of great value, and likewise in *syphilitic cachexia;* and to this effect on the general nutrition may be attributed also its beneficent action in nervous affections, neuralgias, skin disorders, and chronic rheumatic conditions.

How is it best administered?

Dose for a child one year old ʒj, for an adult ʒss or more three times daily. Various expedients are resorted to in order to disguise its taste.

Children, fortunately, soon learn to tolerate or even to like it. When after repeated trials it is not borne by the stomach, or when no gain in weight results, it is doing no good.

ACIDUM PHOSPHORICUM AND ITS SALTS.

Phosphoric acid has been used as an alterative in *scrofulous affections* and *rachitis*, but is inferior to its salts. It is used as acid. phosphoric. dilut., the dose of which is ♏xv to ʒj.

CALCIUM PHOSPHATE.

What are its effects and uses?

This salts forms more than 50 per cent. of bone, and is also an essential part of the soft tissues; a diet from which it is excluded causes sickness and death. Thus, its use is clearly indicated where there is deficiency of bone-formation, as is seen in *rachitis* and *osteomalacia*, and it has been found of value in delayed union after fracture, in caries, and in other diseased conditions of bone. It is also used in chronic phthisis tuberculosis generally, the anæmia of pregnancy, and certain syphilitic lesions, especially gummata and periostitis.

Calcii Phosphas Præcipitatus was recognized as officinal in the U. S. P. of 1880, the dose of which is gr. x or more, *t. i. d.*, but this, owing to its insolubility, is inferior to the lacto-phosphate of calcium, which is much used as an ingredient in emulsions of cod-liver oil.

THE HYPOPHOSPHITES.

What hypophosphites are in general use?

Those of calcium, potassium, sodium, and iron are officinal. They are seldom employed alone, but together in

Syrupus Hypophosphitum, dose ʒj–ij.

Syrupus Hypophosphitum cum Ferro, dose ʒj–ij.

What are their uses?

These syrups, which have been imitated in many proprietary preparations, are useful tonics, furnishing an *easily oxidizable series of salts* which may be *readily converted into phosphates* in the body. They do not represent the activity of *phosphorus* compounds. Like the phosphates, they may be used in anæmia, rickets, mollities ossium, debilitated conditions generally, and tuberculosis, in the last of which the claim of curative action made for them is not now believed.

SARSAPARILLA.

What is sarsaparilla, and what are its effects and uses?

This drug is the *root* of *Smilax officinalis* and other varieties of Smilax. It has been considered to be diuretic, diaphoretic, and alterative, but

physiological experimentation has proven it practically inert. It is used principally as a vehicle for potassium iodide, in the form of syrupus sarsaparillæ comp., in syphilitic disorders. Its other preparations are not of importance.

GUAIACI LIGNUM, GUAIACI RESINA.

What is guaiac?

These two forms of the drug are officinal. The *wood* is the heart-wood of *Guaiacum officinale*, a West Indian tree, containing the *resin* in the proportion of 60 per cent. or more. Guaiac is a very complex substance, but no satisfactory active principle has been discovered.

What are its physiological effects and therapy?

Guaiac has a sialagogue effect from its acrid taste; it also stimulates the hepatic (?) and intestinal secretions. It is absorbed and acts as a diaphoretic (?), expectorant, and alterative. Its continued use may cause gastro-enteric irritation. It is used in *subacute and chronic rheumatism*, in which it has a reputation; in *tonsillitis*, which it may abort, but more often fails; and is probably more successful in cases dependent on the "rheumatic diathesis." It has been used in syphilis, but is of doubtful efficiency.

Mention some other so-called alteratives.

Mezereum, or mezereon, is the *bark* of *Daphne Mezereon* and other species of Daphne, shrubs of Northern Europe. It contains a crystalline glucoside, *daphnin*, and a volatile acrid principle. It is decidedly irritant, and its chief use is as a stimulant to ulcers and to maintain issues. Internally, it has been used as an alterative combined with sarsaparilla.

Sassafras, the *bark* of the root of *Sassafras officinale*, and **Taraxacum**, the *root* of *Dens leonis*, or common dandelion, are believed to be alterative, the latter also having a popular reputation as an hepatic stimulant.

ICHTHYOL.

In what forms does ichthyol occur?

Ichthyol is found in the shops as the ichthyo-sulphates of sodium and ammonium, both of which combine in all proportions with fats and vaseline. Ointments of 10 to 20 per cent. strength are most used. Both are soluble in water, the former having an alkaline, the latter a weak acid, reaction, and both a peculiar bituminous taste and smell.

What are its effects and uses?

Locally, ichthyol is an irritant and a valuable stimulant to sluggish granulations. It is said to have a decidedly alterative effect on the *skin* and *subjacent tissues*. It is used in various skin affections, as *chronic eczema*, *chronic urticaria*, etc.; in *painful rheumatic*, *gouty*, and *trau-*

matic joint conditions. In *erysipelas*, applied freely in one-half strength after thorough disinfection and covered with salicylated cotton, it is said to act very effectively and quickly.

COLCHICUM.

What are its source and composition?

Colchicum autumnale, the seeds (colchici semen) and roots (colchici radix) of which are officinal, is a small plant of Europe. The so-called root is a *corm* or bulb. Both parts have a bitter, acrid taste and contain an alkaloid, *colchicine*, soluble in both alcohol and water, upon which their activity undoubtedly depends.

What preparations of the root are officinal? Of the seeds?

Extractum Colchici Radicis (an acetic extract), dose gr. j–ij.
Extractum Colchici Radicis Fluidum, dose ♏ij–x.
Vinum Colchici Radicis (40 per cent.), dose ♏x-ʒj.
Extractum Colchici Seminis Fluidum, dose ♏ij–x.
Tinctura Colchici, } 16 per cent., dose ʒss–jss.
Vinum Colchici Seminis, }

What physiological effects does it produce?

The effects of moderate medicinal doses of colchicum preparations are more or less *gastric* and *enteric disturbance*, as evidenced by abdominal uneasiness and pain, mild purgation, anorexia, and at times nausea, cardiac depression, and occasionally diaphoresis. A general stimulation of secretions takes place, but the effect upon the urinary solids is disputed, it being held by some that the elimination of urinary solids is increased, by others that it is unaffected. The flow of urine is generally increased. Excessive doses cause symptoms of irritant poisoning, nausea, persistent vomiting, purging, occasionally bloody and severe abdominal pains; convulsions may occur, and there is always profound cardiac depression. Consciousness is preserved to the last, and death takes place from exhaustion or cardiac paralysis.

What is the toxicology of colchicum?

The smallest fatal dose is not clear. Of the wine of the root ʒijss and ʒiijss have proved fatal. Enough has been said of the symptoms. The treatment consists in evacuation of the stomach and intestines, if this has not spontaneously taken place, and the administration of *tannic acid* as a chemical antidote, *opium* and *demulcents* in the later stages to allay irritation, and stimulation as necessity arises.

What are the therapeutic uses of colchicum?

The use of this drug is purely empirical, its therapeutic value having no clear connection with its physiological effects, so far as these are known. In *acute gout* in sufficient doses to excite the skin, kidneys, and gastro-enteric tract, but with care in avoiding the production of vomiting and any

pronounced diarrhœa (of the wine of the root, gtt. x–xx every four hours), it will diminish the pain and swelling and shorten the duration of the attack. In the intervals of the attacks, taken in smaller doses and less frequently, it is a good prophylactic, and is well combined with iodide of potassium. In *subacute rheumatism* and the so-called *rheumatic gout* colchicum in the same combination is very serviceable. In the constipation and functional disturbances of the liver of the gouty diathesis combinations of colchicum and salines are of value.

ANTIPERIODICS.

What are antiperiodics?

These are remedies which, by affecting the nutrition of the body or by a direct paralyzing effect on the malarial organism, check malarial paroxysms.

CINCHONA.

What constitutes officinal cinchona? what is its habitat?

The bark of any species of Cinchona containing *3 per cent. or more of the officinal alkaloids* is recognized as officinal. The original habitat of these trees was South America, but they have been successfully cultivated in India, Ceylon, the West Indies, and elsewhere.

What are the important constituents of cinchona?

The alkaloids of cinchona are *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*, while two others, *quinicine* and *cinchonicine*, have been produced artificially by heating quinine and cinchonine respectively, and are amorphous. Several other unimportant alkaloids have recently been discovered and more or less thoroughly investigated. Quinine and cinchonine exist in combination with *kinic acid*. Cinchona also contains *cinchotannic* and *kinovic acids*, starch, and a trace of a volatile oil.

Name the varieties of bark.

Cinchona Flava (Calisaya or yellow bark) contains a large proportion of quinine and very little cinchonine.

Cinchona Rubra (the red bark) contains a considerable proportion of each.

Pale bark and Carthagena or Columbian bark are weaker in alkaloids, but are used in their manufacture.

Preparations and doses of cinchona and its alkaloids.

Of the yellow bark the following preparations are officinal:

Extractum Cinchonæ, dose gr. v–x.
Extractum Cinchonæ Fluidum, dose ♏v–x.
Tinctura Cinchonæ, 20 per cent., dose ʒj–ij.
Infusum Cinchonæ, 6 per cent., dose ʒj–ij.

Of the red bark only the following:

Tinctura Cinchonæ Composita (Huxham's tincture), a 10 per cent. tincture, containing also bitter orange-peel and serpentaria, and constituting a valuable tonic and antipyretic; dose ʒj–ʒss.

The other preparations mentioned above are seldom used, the following alkaloids and their salts being preferred:

Quinina.
Quininæ Sulphas, gr. j–xx.
Quininæ Bisulphas,
Quininæ Hydrobromas,
Quininæ Hydrochloras,
Quininæ Valerianas,
} practically equal to the sulphate.
Quinidinæ Sulphas,
Cinchonina,
Cinchoninæ Sulphas,
Cinchonidinæ Sulphas,
} dose from one-fourth to one-third greater than of the sulphate.

What are the properties of quinine and cinchonine?

Quinine, either in an amorphous white powder or in the crystalline form, is without odor, very bitter, and practically insoluble in water (1600 parts). Of its salts the bisulphate is most soluble, dissolving in 10 parts of water, the hydrobromate in 16, the hydrochlorate in 34, while the sulphate, the salt most frequently used, is again practically insoluble (740 parts), and hence is commonly given in pill, powder, or capsule. If a solution is desired, aromatic sulphuric acid dissolves the sulphate, grain for minim, and the bisulphate, gr. ij for minim, and these solutions may be administered in capsule.

Cinchonine is a white crystalline substance, somewhat less bitter than quinine, but, like the latter, practically insoluble in water. It is also very insoluble in ether, and is thus separated from quinine, which is easily soluble in that menstruum.

With what drugs is cinchona incompatible?

Its preparations are rendered insoluble by, and are therefore incompatible with, the alkalies and their carbonates, tannic acid, and iodine preparations, while ferric salts precipitate their tannin and form ink.

What physiological effects are produced?

Locally, to mucous membranes and to surfaces denuded of their epidermis quinine and its salts are actively irritant. Internally, in sufficient dosage, the size of which varies greatly with the susceptibility of the individual, a train of symptoms called *cinchonism* is produced. The initial symptoms of this condition are *tinnitus aurium*, some deafness, and a sense of fulness in the head. After large doses these symptoms become more marked, and severe headache, disorders of vision, cutaneous eruptions, giddiness and a staggering gait, delirium, and even collapse, may occur.

Nervous System.—The symptoms produced by quinine would seem to

indicate cerebral congestion, but this has not been proved. However this may be, the tinnitus aurium seems to be due to congestion of the middle ear. In animals the reflex excitability of the spinal cord is diminished or abolished, probably by stimulation of a centre supposed to preside over the reflexes and known as Setschenow's inhibitory centre.

Circulation.—Large doses decrease the force and frequency of the heart's action by a direct action on its motor ganglia, while very large doses produce dilatation of the blood-vessels. Blood-changes occur; the amœboid activity of the white corpuscles is decidedly lessened and their number is diminished; the red corpuscles are decreased in size, and the power of their hæmoglobin to carry oxygen and ozone is impaired.

Digestive Tract.—Upon the stomach quinine acts as a simple bitter, increasing the appetite and digestive powers, but in very large doses it may prove irritant enough to produce nausea and vomiting. It is absorbed *only by the stomach*, the alkaline secretions of the intestinal tract precipitating it and preventing its absorption.

Temperature.—In health the temperature is very slightly affected, but in fever it is lowered promptly and decidedly, probably from a diminished heat-production dependent upon lessened oxidation.

Antiseptic Action.—The activity of the malarial plasmodia is lessened, or they actually disappear from the blood under its use. It also exerts a preventive influence upon putrefactive and allied processes.

As has been already noted, quinine is an excito-motor, with a selective action upon the uterine muscle, but probably only acts after labor-pains have begun, and is incapable of originating them.

How is quinine absorbed and eliminated?

As has already been stated, quinine is absorbed entirely, or for the most part, by the stomach. In the blood it is apparently held in solution by the loosely-combined CO_2 present, and it is eliminated largely by the urine.

What are its therapeutic uses?

Malarial Conditions.—Quinine has been used in a great variety of conditions, but its greatest value has been found in these, for which it is in most cases a specific. In the regular intermittent type it may be used as a *specific* and *prophylactic*. There can be no doubt of its prophylactic value in doses of gr. ij, two or three times daily. Various methods of administration have found favor when the paroxysm has already occurred. Some advocate continued dosage of gr. v–x three times daily, but it is preferable to give it in frequently repeated small doses for twelve hours before the expected paroxysm or in large doses six and eight hours before that time. In any case it is well to continue its use for several days after the paroxysms have ceased, and to induce a slight degree of cinchonism on the seventh day, when a relapse is most

likely to take place. In severe malarial poisoning its efficiency is greatly increased by a mercurial purge.

In the *pernicious form* no delay is permissible, and the patient should be cinchonized as rapidly as possible, it being necessary to give at least as high as ʒss–j during the day, and the hypodermic exhibition of the bisulphate is strongly urged.

In a variety of conditions characterized by periodicity quinine is very valuable. Thus, neuralgias, chorea, hæmaturia, asthma, hay fever, and hiccough may in many cases be cured by quinine, although large doses may be necessary. In chorea and neuralgic headaches it is advisable to determine carefully the presence of any malarial taint before administering this drug, for otherwise they may be made worse by its use. In the irregular and chronic forms of malaria its action is less certain, and it often fails. In *bilious* or *remittent* fever it may be given freely. In conditions of septic intoxication, septicæmia, pyæmia, and puerperal fever it has been much in vogue, but evidence of its utility is wanting. As an antipyretic in typhoid, typhus, and other continued fevers it will undoubtedly lower temperature, but has been largely superseded by the more recent antipyretics. As a *stomachic tonic* it is used in dyspepsia, especially of the fermentative varieties, while in debilitated conditions generally combinations of small doses (gr. j–ij) with iron are of great value. In *fermentative diarrhœas* it may also do good. *Acute coryza* may be aborted by its use in some cases, and chronic bronchitis is often greatly benefited.

Locally, quinine inhalations have been advocated in hay asthma and whooping cough, but have not made good the claims made for it.

What are its administration and contraindications?

Because of its extremely bitter taste quinine is best administered in *freshly-prepared* pills or in capsules. Hypodermically it is particularly efficient, and in pernicious forms of malaria may necessarily be so administered. It should be slightly acidulated by tartaric or other acids to prevent its immediate precipitation by the alkaline reaction of the blood.

Quinine should be used with care when any gastro-enteric inflammation obtains, and is absolutely contraindicated in inflammations of the middle ear. Cases of idiosyncrasy are not uncommon. Combinations with dilute hydrobromic acid or chloral are said to diminish the unpleasant subjective sensations of cinchonism.

What are the properties, effects, and uses of quinidine?

Quinidinæ sulphas, in which form alone this alkaloid is officinal, acts chemically like the sulphate of quinine, but exhibits different refractive qualities. It is weaker than quinine by about one-third, and its effects and uses are similar to those of its sister alkaloid.

What are the effects and uses of cinchonine? Of cinchonidine?

The sulphate of cinchonine is a bitter crystalline salt soluble in 54

parts of water. As a *tonic* and antiperiodic it resembles quinine, but requires about one-third larger dosage.

Cinchonidinæ Sulphas.—Of the properties and powers of this salt too little is at present known. It seems a reliable substitute for quinine.

What is chinoidinum?

This preparation, known as chinoidin or quinoidin, is a blackish resinous substance obtained by evaporating the mother-liquor from which the alkaloids have been obtained by crystallization. It is cheap and efficient according as it contains more or less of the active principles.

What is Warburg's tincture? and what are its uses?

Warburg's tincture is now prepared by modification of a very complicated formula, and owes its efficiency to aromatics and stimulants. It is much used as an antiperiodic in malarial fevers, and is said to be particularly efficient in the severe and malignant forms, in which, after free purgation, it is given in two or three doses of ʒss each before the expected paroxysm. It is a useful tonic in ʒj doses three times a day.

EUCALYPTUS.

What are its source and composition?

This drug is the *leaves* of *Eucalyptus globulus*, a tree native of Australia, but cultivated in other climates. It contains *tannic acid*, *resin*, and a *volatile oil*, the last of which is its active principle, is present in greater amount in the leaves, and has a pungent, aromatic odor and taste.

What are the physiological effects of eucalyptus?

The effects of this drug are not clear. In large doses it produces some mental exhilaration, and excessive doses produce sensory disturbances, as numbness, sense of weight in limbs, etc., and some motor palsy, probably by paralysis of the spinal centres, as the peripheral nerves retain their irritability. Death is said to be caused in animals by paralysis of the respiratory centre. The oil (oleum eucalypti or eucalyptol) is an antiseptic and more or less irritant, and possesses the general stimulant properties of the volatile oils.

What are its uses?

Eucalyptus is used empirically. It meets with success in mild malarial attacks, probably like other volatile oils, not as a specific, and is an *excellent stimulant expectorant* in *acute and chronic bronchitis*. The usual form for administration is the oil in doses of gtt. iij–v. Eucalyptol is also used with an idea to remote disinfection in offensive discharges of the broncho-pulmonary and genito-urinary passages.

The cultivation of the trees is said to render malarial districts more inhabitable.

ANTIPYRETICS.

Antipyretics are drugs which so modify nutrition as to lower febrile temperatures.

ACIDUM SALICYLICUM (SALICYLIC ACID).

What are its preparation and properties?

Salicylic acid may be obtained from the methyl salicylate of oil of wintergreen or oil of birch. Most of it, however, is formed artificially by the combination of carbonic acid and phenol. It occurs as permanent, fine, needle-shaped crystals, odorless, tasteless or with a somewhat astringent after-taste, and an acid reaction. It is practically insoluble in cold water (450 parts), but freely so in alcohol, ether, and glycerin.

What preparations contain salicylic acid?

Acidum Salicylicum, dose gr. x–3j.
Lithii Salicylas, dose gr. xx–xl.
Sodii Salicylas, dose gr. xx–3j.
Physostigminæ Salicylas (see *Physostigma*), dose gr. $\frac{1}{80}$.

What are its physiological effects?

As might be inferred from its origin, salicylic acid resembles carbolic in its effects. Given in sufficient doses, it causes symptoms somewhat resembling *cinchonism*—tinnitus aurium and a feeling of fulness in the head, or, if more pronounced, deafness, ptosis, strabismus, partial blindness, and excessive sweating. In cases of poisoning, ptosis, restlessness, and severe headache, delirium, either wild or of a melancholic type, *olive-green urine*, and slow and labored respiration occur, ending in collapse and death.

Nervous System.—Ordinarily the cerebral symptoms produced resemble those of quinina, and the delirium is not marked: whether they are due to congestion or anæmia is not clear.

Circulation.—Authorities differ about the cardiac effects of this drug, but in medicinal doses it has little or no depressing effect upon the circulation. It is claimed that excessive doses produce slow and labored pulse. In the blood it has been proved to have a depressing effect on the activity and emigration of the white blood-corpuscles.

Respiration is at first stimulated, later depressed.

Temperature.—In health this function is not affected by moderate doses, but in febrile conditions in large doses it produces a considerable fall of temperature, which is preceded or accompanied by profuse sweating. To obtain this effect large doses (3j) must be given. Continued administration may cause gastric disturbance.

How is it absorbed and eliminated?

Salicylic acid is probably absorbed as an alkaline (sodium) salicylate.

It is eliminated chiefly by the urine in its own form or as salicyluric acid. The absorption is rapid, the acid appearing in the urine in from eight to ten minutes, but the elimination is slow. The urine is colored green by an increase of the indican, and after excessive doses may be albuminous from renal irritation. The antiseptic effects of salicylic acid will be considered elsewhere.

What are the therapeutic uses of salicylic acid?

The great field for salicylic acid at present is in the treatment of *acute articular rheumatism*. Given in doses of gr. x–xv every two or three hours, it reduces the temperature, relieves the pain, and greatly shortens the painful part of the attack; but there is doubt as to its efficacy in preventing relapses and cardiac complications; in fact, most authorities are veering to the belief that it does not. It is advantageously combined with alkalies, and more than enough bicarbonate of soda to neutralize it is generally prescribed (about 6 parts of the alkali to 10 parts of the acid).

In *gonorrhœal* and *subacute rheumatism* it is less efficient, but often proves valuable, while in *lumbago* and *myalgia* generally, and in chronic rheumatism and gout, it is often serviceable. In *acute tonsillitis*, especially in those cases which seem to depend upon a rheumatic diathesis, it is often of signal service in small, frequently-repeated doses. *Rheumatic iritis* has been reported cured by its use. In typhoid and other continued fevers and in the exanthemata it is now seldom used as an antipyretic. As it does not destroy the spirillum of relapsing or the plasmodium of malarial fever, it can in no sense be considered a specific in these conditions, but may do good by abating certain symptoms. especially the fever, although we now have better antipyretics.

SALICINUM (SALICIN).

Salicin is a glucoside obtained from *Salix helix* and other varieties of Salix. It occurs in permanent, odorless, prismatic crystals of bitter taste, and is soluble in 28 parts of water and 30 of alcohol, and insoluble in ether and chloroform. Hence it is generally given in capsules, wafers, or pills, or in mixtures.

What are its effects and uses?

The effects of salicin are not pronounced. Compared to salicylic acid, it is less irritant to the stomach, and perhaps less apt to cause unpleasant head-symptoms, and it is free from toxic effects. Part of it at least is converted into salicylic acid in the blood. It is useful in *acute rheumatism*, accomplishing the same results as salicylic acid, but acting much more slowly. When the latter drug causes gastric irritation or cerebral symptoms, this will prove a very efficient substitute in doses of gr. xv–xx every two or three hours. It is also used as a bitter tonic, as an antifermentative in diarrhœas, and occasionally as an antiperiodic.

OLEUM GAULTHERIÆ.

What are its source and physical properties?

Oil of gaultheria is a very volatile, slightly yellowish liquid, derived from *Gaultheria procumbens*. It has a peculiar penetrating odor, and consists of 90 per cent. *methyl salicylate*. Its salicylate strength is five-sixths that of salicylic acid, and the dose should be proportionately larger.

What are its physiological effects?

These are identical with those of salicylic acid, and it forms in capsules or in mixtures a reliable and easy method of administering the salicylates in *acute rheumatism*, the usual dosage being about 150 drops daily in frequently repeated doses. Oil of birch is often substituted for it, and is equally or even more efficient. The odor of the oil appears in the urine under its use, and this secretion decomposes less rapidly. Hence the oil is used with a view of asepticizing the genito-urinary tract.

SALOLUM (SALOL).

What are its derivation and properties?

Salol is salicylate of phenol, or salicylic acid in which 1 atom of H has been replaced by phenol. It is a white crystalline powder, with a slight odor of oil of wintergreen, tasteless, nearly insoluble in water, but soluble in alcohol and ether.

What effects does salol produce?

Salol is not dissolved in the stomach, but in the alkaline secretion of the intestinal tract it is slowly broken up into its two component parts, yielding 36 parts of carbolic and 64 parts of salicylic acid. In its effects it more closely resembles salicylic acid, producing ringing in the ears and other constitutional symptoms of that drug, but to a less degree and with almost no gastric disturbance, as it is not dissolved in the stomach. After large amounts the urine has a smoky color of carbolic-acid poisoning.

What are its therapeutic uses?

It is a good *disinfectant*, and is used as such in the various forms of *stomatitis* and *pharyngitis*, while its similarity to salicylic acid renders it a valuable substitute for that drug in *acute rheumatism* and as an *antipyretic*. It is used also to render the urine aseptic in cystitis, and at one time was in favor as an intestinal antiseptic in *typhoid fever* and *cholera*. It can be useful in these conditions only by preventing the development of bacteria, as its dilution must be far too great for any actual germicidal effect; and even in strong solutions its germicidal powers are so weak as to render it probably inert in these conditions. Its value is still *sub judice*. Owing to its insolubility in the stomach, it may be used as a test of the peristaltic activity of that organ or of the presence of pyloric

obstruction. When the stomach is healthy the urine should show the presence of salicyluric acid in from one-half to three-quarters of an hour, and if its appearance be delayed *beyond an hour* a pathological condition is probable.

How is salol prescribed?

Salol is generally given in pill or capsule, the dose being gr. v–x, repeated rather frequently. When its local action is desired in the mouth or pharynx, tablets slowly dissolved in the mouth are useful.

BETOL, OR NAPHTHOLOL.

What are its chemical and physical properties?

Betol is another of the same series, and is analogous in composition to salol, the difference consisting in the substitution of *beta-naphthol* instead of phenol for the H atom. It occurs in small whitish crystals, insoluble in water, but soluble in alcohol and fats, and having a high melting-point.

What are its physiological history and uses?

Like salol, it passes undissolved and unabsorbed through the stomach, is converted into its component parts by the pancreatic secretion, and *acts as salicylic acid, of which it yields about 55 per cent.* It is entirely nontoxic. Of its antiseptic properties and therapeutic uses the same may be said as of salol, but, owing to its lesser percentage of the acid, it is probably not as efficient.

ACIDUM CARBOLICUM (CARBOLIC ACID).

What is carbolic acid? What are its synonyms and method of preparation?

Although this drug finds use chiefly as an antiseptic, yet its physiological effects and chemical composition demand for it notice in this connection. Carbolic acid, known also as *phenol, phenic acid, phenyl hydrate,* and *phenyl alcohol,* is a coal-tar derivative. It is formed by adding a hot concentrated solution of potash to crude coal-tar, and then water, when it is converted into a light oil and a heavier alkaline liquid, which latter is neutralized by hydrochloric acid, when crude carbolic acid "separates out." In this form it contains several analogous substances, chiefly *xylic* and *cresylic acids,* which possess very similar properties to itself.

What are its characteristics?

When pure, carbolic acid is colorless, solid at ordinary temperatures, crystallizes at ordinary temperatures, and has a characteristic odor and burning taste. Pure acid, however, is hard to obtain, and it generally presents a slight pinkish tinge on standing. These impurities, however, do not affect its efficacy, some even holding that its contaminating acids are more powerful than carbolic acid itself. It is *soluble in 20 parts of water* (5 per cent. solution), and freely so in *alcohol, ether, glycerin, and*

the fixed and volatile oils, and *deliquesces without dissolving* when exposed to moist atmospheres. It is neutral in reaction, but combines with salifiable bases.

What are its physiological effects?

Locally, phenol is a protoplasmic poison, destroying all organic tissues. It produces more or less anæsthesia, not only of the parts with which it comes in immediate contact, but also of the underlying tissues, and in its pure state produces white eschars followed by a superficial gangrene.

Absorption and Elimination.—Carbolic acid is probably absorbed, and exists in the blood as an alkaline carbolate. It is eliminated by all the secretions as an alkaline carbolate, as well as certain products of its oxidation when small amounts are ingested, but mostly unchanged after large doses.

Nervous System.—Poisonous doses produce in man vertigo, contracted pupils, and tremors, while in animals convulsions, apparently of spinal origin, and paralyses, occur.

Circulation.—The *heart* is at first slowed and then accelerated (by stimulation and subsequent exhaustion of the vagi(?)); the arterial pressure is at an early period lowered by paralysis of the vaso-motor centre in the medulla; and the movements of the white blood-corpuscles are rendered more sluggish.

The *respiration* is rendered rapid and shallow by large doses, and some reduction of *temperature* takes place. The *urine* derives a *dark-brown* color from the oxidation products, and as this *smoky color* gives the first warning of poisoning by either its external or internal use, the urine should be carefully watched and the drug withdrawn upon its earliest appearance.

What are its symptoms, diagnosis, treatment, and post-mortem appearances?

The poisoning may be slow or rapid. In the slow variety, which occurs from absorption after operations or dressings, the symptoms are smoky and albuminous urine, great feebleness and collapse, diminished circulatory and respiratory power, muscular weakness, and giddiness. In the rapid form, occurring after the ingestion of a concentrated fatal dose, the symptoms are impairment of sensation and motion, unconsciousness, stertor, feeble and frequent pulse, collapse, tremors, and death. If the patient lives long enough, symptoms of gastro-enteric irritation may develop.

The *diagnostic signs* are the characteristic *odor of the breath*, *whitened patches* on the visible mucous membranes, and *discolored urine*.

The *treatment* consists in the evacuation of the stomach by the *stomach-pump*, and the administration of some *soluble sulphate*, as the sulphate of magnesium or sodium or dilute sulphuric acid. These form the comparatively harmless sulphocarbolates. Free hypodermic stimula-

tion with ammonia, ether, or alcohol, and demulcent drinks during the later stages, complete the treatment.

Appearances Post-mortem.—After the ingestion of a fatal dose of the concentrated acid hard white areas of necrotic tissue, surrounded by zones of inflammation, are found wherever the acid has been in contact; the hollow viscera are filled with imperfectly coagulated blood, and the liver and kidneys sometimes show fatty degeneration.

What are the preparations of carbolic acid?

Acidum Carbolicum, dose gr. j–iij.
Unguentum Acidi Carbolici, 10 per cent.
Acidum Carbolicum Crudum, for disinfecting purposes.

What therapeutic uses does carbolic acid fulfil?

Internally, carbolic acid is employed for its *local effects* in *nervous vomiting* and *gastrodynia*. which are alleviated by the anæsthesia produced —gr. j–ij doses repeated frequently; in *diarrhœas*, especially of the irritative and fermentative varieties—generally combined with bismuth; in *gangrene of the lung*, which is said to be much benefited by its combined use internally and by inhalation.

Locally, the pure acid may be used as a caustic where extensive action is not desirable, as in condylomata, diphtheritic conditions, etc.; in weaker solutions it is a favorite ingredient in gargles and sprays. Burns and painful or itching ulcers may be relieved by its weak dilutions in oily menstrua (gr. x–xv to ℥j of petrolatum, etc.). Injections of 2 per cent. solutions into inflamed serous cavities, as in *synovitis*, have been employed with good effect, while the injection of a few drops of the pure acid into the tunica vaginalis after aspiration of the contents of a *hydrocele* is one of the best methods of radical cure. The use of carbolic acid as an antiseptic will be mentioned later.

SODII SULPHO-CARBOLAS (SULPHOCARBOLATE OF SODIUM).

This salt, which we have seen is the harmless result of administering soluble sulphates in carbolic-acid poisoning, is a colorless, transparent salt, permanent in the atmosphere, soluble in 5 parts of water and also in glycerin and alcohol. The corresponding salts of magnesium, potassium, and calcium are also employed.

What are the effects and uses of the last-named salts?

They possess weaker antiseptic properties than carbolic acid, but from their non-toxic effects are employed to fulfil many of the indications for which that drug is used. Thus, they are valuable in gastric and intestinal disorders, *vomiting* and *flatulence* being especially benefited, and as topical applications in inflammations of the mouth, nose, and pharynx.

CREOSOTUM (CREOSOTE).

What are its origin, method of preparation, and composition?

Creosote is obtained as a product of the dry distillation of wood-tar or from crude pyroligneous acid. It is a colorless, oily liquid, turning dark on exposure, and having a peculiar smoky odor, burning taste, and neutral reaction. It is soluble in 80 parts of water, and in all proportions in alcohol, ether, chloroform, benzine, and acetic acid. In composition it is very complex, containing *phenol*, *cresilol*, *creasol*, and other substances of the hydrocarbon series. The pure drug is difficult to obtain, and crude phenol is often substituted for it—a sophistication which can be detected by its solubility in commercial glycerin, while creosote is not.

What are its effects and uses?

Creosote possesses many qualities in common with carbolic acid. The symptoms of poisoning and the proper antidotes are the same as for that drug. It is eliminated by the kidneys and the bronchial mucous membrane, upon the latter of which it acts as a stimulant expectorant.

Its *uses* also correspond to those of carbolic acid, but it is more used to *allay vomiting* and *gastralgia*, and is a good *astringent antiseptic in diarrhœas*. It is at present used in *pulmonary tuberculosis*, and, combined with proper hygienic measures, may cure in the early stages. Locally, it is used in varying degrees of dilution as a dressing for foul-smelling and indolent ulcers and in irritative skin diseases, and as a gargle in putrid sore throat. In dentistry it is much used as an analgesic in toothache.

How is it administered?

The dose for internal administration is gtt. ss–ij, and should be taken frequently.

Aqua Creosoti, a 1 per cent. solution, is a convenient form of administration. This preparation may be used externally as a disinfectant and to allay itching, but carbolic acid is more used, because less expensive.

CREOLIN, KREOLIN.

What is creolin?

This drug, a recent importation, proprietary and not yet in general use, is a derivative of coal-tar. Its specimens vary in composition, some being soluble in water, while others form emulsions. It is a dark-brown, syrupy liquid, of tarry odor and somewhat biting taste.

What are the effects and uses of creolin?

Creolin is an antiseptic, and is said to be more powerful against non-spore-bearing than against spore-bearing organisms. It is absolutely innocuous to man. It is used in *1 to 2 per cent. solutions*, and is a stimulant *to indolent granulations*. Solutions of 1 per cent. strength are useful

substitutes for dressings of carbolic acid or bichloride of mercury when these prove irritant to the skin.

THYMOL.

What are its source and properties?

Thymol (*cymylic*, *phenol*, or *thymic acid*) is a crystalline solid, or occasionally a liquid, obtained from oil of thyme (oleum thymi) by fractional distillation. Oil of thyme is a volatile oil derived from *Thymus vulgaris* and other plants. Thymol is soluble in 1200 parts of water, and freely so in alcohol, ether, chloroform, and oils, and has a peculiar odor which to some individuals is unpleasant, and which in summer attracts flies.

What are its effects and uses?

Thymol is a strong antiseptic, ranking just above carbolic acid in power, and resembling it in producing cutaneous anæsthesia. Taken by mouth, it causes *tinnitus aurium*, partial deafness, some reduction of temperature, with at times nausea, vomiting, and diarrhœa. Although less toxic than carbolic acid, large doses may cause violent delirium and collapse, accompanied by profuse sweating and a *dark-green* coloration of the urine. It may be used to fulfil the indications for carbolic acid, but is expensive and little used. As an antiseptic mouth-wash in *aphthous stomatitis* it is particularly valuable, and in 1 : 1000 solutions (made with alcohol) it is a good antiseptic and non-irritating to the skin.

RESORCIN.

What are its source and properties?

Resorcin is a substance first obtained from the resins of galbanum and asafœtida, but now derived from phenol, to which it is closely related chemically. It is crystalline, colorless at first, but becomes reddish on exposure, and is freely soluble in water, alcohol, and ether.

What physiological effects are produced?

In doses of gr. xx to xl resorcin causes giddiness, tinnitus aurium, profuse diaphoresis, and reduction of temperature, the last, however, not being constant and of uncertain duration. After poisonous doses cerebral and sensory disturbances, unconsciousness, convulsions, and collapse may follow.

For what conditions is it employed?

This drug is now seldom used as an antipyretic, being uncertain and unsafe in the dosage required to produce such effects. It is employed as an *antifermentative* and *analgesic* in *gastric ulcer*, gastralgia, and diarrhœal disorders: as a spray-inhalation it is of reputed efficiency in *pertussis* and *hay asthma*.

Externally, it may be employed in the same surgical conditions as carbolic acid, to which it is preferable because of the lesser danger of

toxic effects and its freer solubility in water. It has been particularly recommended in erysipelas, cystitis, chronic otitis, and leucorrhœa. For antiseptic purposes solutions of from 1 to 5 per cent. are used. Ointments of from 5 to 10 per cent. are also used for a variety of skin diseases.

BENZOINUM (BENZOIN.)

ACIDUM BENZOICUM (BENZOIC ACID).

What is benzoin?

Benzoin is the concrete *juice*, occurring in tears, obtained from incisions into *Styrax Benzoin*, a Peruvian tree. It is a *balsam*, being composed chiefly of *resin* and *benzoic acid*, with the occasional presence of *cinnamic* acid. It also contains a *volatile oil*. It owes its efficiency chiefly to benzoic acid.

What are the preparations of benzoin?

Ammonii Benzoas,
Lithii Benzoas,
Sodii Benzoas,
Acidum Benzoicum, } dose gr. x–xxx.

Tinctura Benzoini, 20 per cent., dose ℥xx–xl.

Tinctura Benzoini Composita ("friar's balsam") contains benzoin, storax, balsam of Tolu, and aloes; dose ʒss–ij.

What are the source and appearances of benzoic acid?

Benzoic acid is obtained by sublimation from benzoin, or it may be made artificially from hippuric acid, the latter, however, lacking the characteristic vanilla-like odor and being used only in the arts. It takes the form of shining hexagonal scales with a slightly aromatic odor, warm acid taste, and acid reaction. It is soluble in 500 parts of water, and freely so in ether, alcohol, and in 7 parts of chloroform.

What effects does it produce?

Locally, it is an irritant and protoplasmic poison, and is about equal to salicylic acid as a germicide. In therapeutic doses it is followed by very few symptoms, and its chemistry in the body is not clearly understood. In large doses it increases the circulatory and respiratory force, and is claimed to produce a greater fall of temperature than salicylic acid. It stimulates the cutaneous and bronchial secretions. Its chief effect of interest is in *acidifying the urine*, which is accomplished by its conversion into *hippuric acid*, which takes place in the kidneys, and probably at the expense of the uric acid, which is therefore decreased. It produces none of the unpleasant effects of salicylic acid.

What are the uses of benzoic acid?

This drug is a standard remedy in *cystitis* and whenever there is a *tendency to the formation of phosphatic calculi*. It has also been advo-

cated in *acute rheumatism*, in which it is less efficacious and better borne than salicylic acid; in *diphtheria*, locally and internally; and in *diabetes*. Its antiseptic properties will be noticed elsewhere.

What are the properties, effects, and uses of sodium benzoate?

The benzoate of sodium is a white, amorphous, freely-soluble powder, having a faint odor of benzoin, a sweetish astringent taste, and a neutral reaction. It has been used in the same conditions as benzoic acid—viz. rheumatism, cystitis, and diphtheria, in the last of which it is given in large doses.

Has benzoate of lithium any advantages?

This salt has recently been introduced for use in the *uric-acid diathesis*. The theory of its action is that the formation of uric acid is lessened by the benzoic acid, and that the lithium element will form with the remainder the more soluble lithium urate, and hence is the more readily eliminated. It is better borne by the stomach than benzoic acid. It is also antiseptic.

ANTIPYRINUM (ANTIPYRIN).

What are its sources and properties?

Antipyrin is derived by a complicated patented process from *chinoline*, a coal-tar derivative. Chemically, it is *oxydimethylchinicin*, and occurs as a somewhat bitter grayish crystalline solid, easily soluble in water, alcohol, and chloroform.

What are its physiological effects?

Given in medicinal doses (gr. xv.) in fevered patients, it produces a fall of temperature which reaches a maximum in from two to five hours, lasts five to eight hours, and is generally accompanied by sweating and slight depression. Owing to its slow elimination the duration of its antipyresis is greater than that of other antipyretics of this group. After larger doses or continued administration it causes general malaise, a peculiar cyanosis of the skin, feebleness of the pulse, and frequently an eruption which may resemble urticaria, measles, or erythema, and may be accompanied by œdema, catarrhal inflammations of the mucous membranes (conjunctivitis, coryza, or laryngitis), and sometimes by constitutional disturbances. In detail its effects are as follows:

Nervous System.—Giddiness, somnolence, unconsciousness, coma, and epileptiform convulsions may occur after large doses from some unexplained cerebral influence; the spinal cord is at first stimulated and then depressed, the reflexes becoming tardy or abolished, while both motor and sensory nerves are depressed.

Circulation.—In sufficient dosage it is undoubtedly a cardiac depressant; the arterial pressure is at first increased and later decreased, a vaso-motor dilatation taking place at the surface, to which, rather than

to the diaphoresis, the fall of temperature is due, as it takes place nearly to the same degree when atropine is given to check the sweating.

Respiration.—This function is not affected by moderate doses; by large ones it is depressed, dyspnœa and rapid breathing occurring in some cases.

Temperature.—The lowering of temperature is due, as we have seen, partly to diaphoresis, but principally to *increased heat-radiation*, and *perhaps* to a *lessened heat-production*, resulting from a direct influence on the thermogenic centres. That the latter is a probable element is shown by the lessened elimination of nitrogenous waste in the urine under its use. Antipyrin is well borne by the stomach, especially when administered with wine or aromatics.

What are the uses of antipyrin?

Antipyrin may be therapeutically employed for the following: (1) to *reduce temperature* and abate accompanying symptoms in *typhoid*, *typhus*, *pneumonia*, the *exanthemata*, etc. whenever it is evident that the elevation of temperature of itself is harming the patient; (2) to *allay motor-excitability* in chorea, epilepsy, dysmenorrhœa, after-pains of labor, etc., but there are better remedies; (3) to *relieve pain* in *migraine*, *neuralgias*, the *lightning pains* of *locomotor ataxia*, etc.; in *rheumatism* it acts much like salicylic acid, reducing the temperature and relieving pain, but affording no security against relapses; (4) it is considerably used as a substitute for morphine in attempting the cure of the morphine habit; it is a valuable hæmostatic: thus, spraying or sniffing it up the nose will often check epistaxis, and hæmatemesis and hæmoptysis are said to be benefited by its exhibition by stomach or inhalation, as the case may be.

How is antipyrin prescribed?

It may be given in solution, pill, or capsule. When given in fevers for antipyretic purposes it is best to administer it in alcohol, to counteract its depressing effects; dose gr. v–xv.

ANTIFEBRIN.

What is antifebrin?

This drug is an anilin derivative, and chemically is *acetanilid* or *phenyl-acetamid*. It is an odorless, slightly bitter crystalline powder, *not very soluble in water*, but freely so in alcohol, ether, and chloroform.

How do its effects compare with those of antipyrin?

Antifebrin resembles antipyrin in its action as far as this is understood, but produces less sweating, is less apt to cause cyanosis, respiratory disturbance, cutaneous eruptions, and collapse, although these are all reported to have occurred in some cases. Some experiments have been made tending to show that its antipyretic effect is due to a centric effect upon the heat-producing nervous centre. In healthy persons little

or no decrease of fever is produced. It agrees well with the stomach, occasions no nausea, and often even promotes the appetite.

What are the therapeutic uses of antifebrin?

Antifebrin in gr. iv doses is about equal to gr. xv of antipyrin, and may be used as an antipyretic in the same conditions, acting with equal promptness and efficiency and for nearly the same length of time. It is not as efficient in rheumatism and motor disturbances, but may be used in migraine, neuralgias, etc. It is cheaper than antipyrin. Owing to its insolubility, it is generally given in capsule, wafer, or tablet form.

PHENACETIN.

What are its properties?

Phenacetin, which has only recently been introduced, is a tasteless, colorless, crystalline substance, only slightly soluble in water, but more soluble in alcohol.

What are the effects and uses of phenacetin?

It acts as an antipyretic, without producing vaso-dilatation, with a varying degree of diaphoresis, and probably from an effect on the nervous centres. Like antipyrin, it is analgesic, but unlike that drug unpleasant results are seldom developed, and, being less poisonous and probably equally efficient, it is a valuable antipyretic. (For uses of phenacetin compare *Antipyrin.*)

THALLIN.

What are the properties and effects of thallin?

Thallin occurs in two forms, the sulphate and tartrate, both yellowish-white crystalline powders with a bitter taste. The sulphate, commonly used, is soluble in 7 parts of water. In ordinary doses (gr. v) it produces a fall of temperature, at times accompanied by considerable sweating. After larger doses a great fall of temperature, profuse perspiration, and at times an erythematous eruption and cyanosis, occur. The urine assumes a *greenish hue* under its use. The blood-pressure is diminished only by large doses. In some cases violent chills are developed during the reactionary rise of temperature, and vomiting and diarrhœa have been observed.

What uses may it fulfil?

Although dangerous in large doses, in repeated small doses (gr. ij–iij) it is an efficient antipyretic with very little danger, and may be used in acute rheumatism and conditions of high temperature. In 1 : 1000 solutions it is an antiseptic, and ½ to 2½ per cent. solutions may be injected into the urethra with gratifying results in gonorrhœa and gleet.

KAIRIN.

What are its source, effects, and disadvantages?

Kairin is a chinolin derivative, crystalline, bitter, and easily soluble. In gr. v–x doses it exerts an antipyretic effect, causes copious sweating, and is a cardiac depressant. It has no advantages over antipyrin and other drugs of this group, and, although no deaths are reported from its use, the symptoms have been so alarming that it has fallen into disuse.

NAPHTHALINE.

How is it manufactured? What are its properties?

Naphthaline is a benzol derivative, obtained by dry distillation of coal-tar, and occurring in white, shining scales, insoluble in water, but soluble in alcohol, ether, chloroform, and oils.

What effects and uses has naphthaline?

This drug disinfects, or at least deodorizes, the fæces. It or its products are eliminated by the urine, upon which it acts as an antiseptic, postponing decomposition. It is chiefly used in *chronic diarrhœa* (gr. v–x in capsule every four or six hours) and as a disinfectant in *intestinal catarrhs*. It is also highly spoken of in bronchitis and bronchorrhœa and in diseases of the intestinal tract. Locally, in 10 per cent. oily solution it is used in *scabies* and *prurigo*. At one time it bade fair to be useful in typhoid fever, and some cases were supposed to be aborted by its use, but it has not sustained its reputation.

STOMACHIC BITTERS.

What are the classes of bitters?

The vegetable bitters may be arranged in three classes: (1) *simple* or *pure bitters;* (2) *aromatic bitters*, which contain a *volatile oil* as well as bitter principle; (3) the *astringent bitters*, which contain *tannic* and *gallic acids*, and are astringent as well as tonic.

What effects are common to bitter tonics?

Probably all bitter substances increase more or less the activity of the glands with which they come in contact, and thus promote digestion and increase the appetite. The increased ingestion of food and improved assimilative powers affect the general nutrition, so that they are *indirect tonics*. In over-doses they are somewhat irritant, and may cause nausea and occasionally vomiting and diarrhœa.

When are they indicated? when not?

Bitters are chiefly of use when the appetite is poor and during slow convalescence from acute disease. They are contraindicated when there is inflammation or over-sensitiveness of the alimentary tract.

SIMPLE BITTERS.

QUASSIA.

What are its source and active principle?

Quassia is the *wood* of *Picræna excelsa*, a tree of the West Indies. It is odorless, but very bitter, and yields its activity, which is due to a neutral principle, *quassin*, to both alcohol and water.

What preparations are used?

Extractum Quassiæ, dose gr. j–iij.
Extractum Quassiæ Fluidum, dose ♏v–xv.
Tinctura Quassiæ, 10 per cent., dose ʒj–ij.
Quassin, the bitter principle, may be given in gr. ss doses.

For what purposes are they used?

Like other simple bitters the preparations of quassia may be used in *anorexia*, *atonic dyspepsia*, *chlorosis*, and *atonic conditions generally*. An *infusion* (ℨj–ij to Oj), as we shall see later, is an excellent injection for "seat-worms."

GENTIANA (GENTIAN).

What are its source and composition?

Gentian is the *root* of *Gentiana lutea*, a perennial plant of the Alps. Water and alcohol extract its virtues, which reside in an intensely bitter principle called *gentio-picrin*, besides which gentian contains a fixed oil and *gentisic acid*, which is tasteless and inert.

What are its preparations, effects, and uses?

An *extract*, *fluid extract*, and *compound tincture* are officinal, the last of which contains gentian, cardamom, and bitter orange-peel, and is probably more used than any other simple bitter (Tinctura Gentianæ Composita, ʒj–ij). Gentian is a very efficient bitter, and is said to be somewhat laxative in large doses. The indications for its use are the same as for *Quassia*, q. v.

CALUMBA (COLUMBO).

What are its source and constituents?

Calumba, or columbo, is the *root* of *Jateorrhiza calumba*, a climbing plant of Mozambique. It contains two bitter principles, *columbin* and *berberine*, columbic acid, and starch, and yields its bitterness to alcohol and water.

What are the preparations, effects, and uses of calumba?

Calumba, the powdered root, dose gr. x–xx.
Extractum Calumbæ Fluidum, dose ♏x–xx.
Tinctura Calumbæ, dose ʒj–ℨss.
Calumba is very slightly aromatic, is very well borne by the stomach,

and may be used whenever a simple bitter is indicated, sharing with gentian the preference among bitter tonics of its class.

CHIRATA.

What are its chief points of interest?

Chirata, which is the entire *herb* of *Ophelia chirata*, an East Indian plant, contains a bitter principle, *chiratin*, and *ophelic acid*. It is one of the best of the simple bitters, resembles gentian, and may be used in the same ways.

The preparations are—

Chirata, dose gr. xx.

Extr. Chiratæ Fl., dose ʒss.

Tinctura Chiratæ, 10 per cent., dose ʒj–ij.

HYDRASTIS.

Give its derivation and properties.

Hydrastis, known variously as *golden seal*, *yellow root*, *orange root*, etc., is the *rhizome* and *rootlets* of *Hydrastis Canadensis*, a small native plant. It contains a yellow alkaloid, *hydrastine*, a white one, *berberine*, and probably a third, *xanthopuccine*, besides starch, sugar, etc. The exact status of this drug is not clear, recent experiments having shown it to be allied to strychnine. At present it seems best to consider it in this connection.

What are its preparations?

Extractum Hydrastis Fluidum, most used, dose ʒss–ij

Tinctura Hydrastis, 20 per cent., dose ʒss–j.

What effects does it produce?

Hydrastis is a stomachic bitter, with a *particular stimulant effect on the hepatic* and intestinal secretions. Given to frogs, the alkaloid, *hydrastine*, heightens the reflexes and excites motor irritability, producing tetanic convulsions; but these effects are much *less in degree* and *longer* of *duration* than those of strychnine. The *circulatory* effects are disputed: probably the heart is slowed and the arterial pressure raised as by digitalis, with a later depression of the vaso-motor system. It is said to be diuretic, and it possesses the power to produce contractions in the non-pregnant uterus, and is said to have produced abortion.

What therapeutic utility has hydrastis?

Hydrastis is used as a tonic in *dyspepsia* and *chronic gastritis;* also in *duodenal catarrh*, *catarrhal jaundice*, and *constipation*, from its stimulant effect on the hepatic secretion. *Cystitis* is said to be benefited by its use, while *gonorrhœa* in the declining stages and *gleet* are improved *by urethral* injections of the fluid extract (♏xv to ʒj), as are otorrhœa,

leucorrhœa, and other mucous discharges. *Menorrhagia* and *metrorrhagia* are often decidedly benefited by the fluid extract in repeated doses, either alone or combined with ergot.

AROMATIC BITTERS.

As we have already seen, the essential constituents of drugs of this class are a *volatile oil* and a *bitter principle*. Most of them contain in addition more or less tannic acid.

SERPENTARIA (VIRGINIA SNAKEROOT).

What are its source and constituents?

Serpentaria consists of the *rhizome* and *rootlets* of *Aristolochia serpentaria* and *A. reticulata*, two indigenous plants. These contain a *volatile oil*, *bitter principle*, *resins*, and *tannin*, and have an agreeable aromatic odor and bitter somewhat pungent taste.

What are its preparations?

Extractum Serpentariæ Fluidum, dose ℥x–xxx.
Tinctura Serpentariæ, 10 per cent., dose ʒj–ʒss.

What are its effects and uses?

Serpenteria is a *stimulant tonic*, with somewhat *diuretic* and *diaphoretic* properties. In large doses it may cause vomiting, purging, and other symptoms of gastro-intestinal irritation. It is an elegant tonic, and is often combined with stronger bitters, and also with cinchona, in the treatment of intermittents (see *Huxham's Tincture*) and in slow convalescence from fevers.

ANTHEMIS (CHAMOMILE).

What is chamomile, and what are its active principles?

This drug is the *flower-heads* of *Anthemis nobilis*, a small trailing plant of Europe, cultivated also in this country. It contains a *volatile oil*, a *bitter principle*, and a trace of *tannic acid*, and has a strong, peculiar odor, probably due to *anthemic acid*.

What are its effects and uses?

Chamomile is a good *stimulant* tonic, especially used during convalescence. The usual method of administration is in *infusion*, dose ʒij two or three times daily. In larger doses of the hot infusion it is an *emetic*. Of the powder the dose is ʒss–j.

Matricaria, or German Chamomile, the flowers of *Matricaria chamomilla*, is very similar in composition and properties, but its taste is more disagreeable, and it is seldom used in this country.

EUPATORIUM.

What are its botanical name and its active principles?

Eupatorium perfoliatum, *boneset* or *thoroughwort*, is a common indigenous plant, the *leaves* and *flowering tops* of which are officinal, and contain a bitter glucoside, *eupatorin*, tannic acid, and a small amount of volatile oil. It is usually given in infusion, but has an officinal *fluid extract*, the dose of which is ℥xx to ʒj.

What are its effects and uses?

Thoroughwort is a *stomachic tonic*, *expectorant*, *and diaphoretic*, and in large doses may prove emetic. It is a standard domestic remedy for "cold" and *bronchitis*, for which it is given in hot infusion freely, and has been used in rheumatism with asserted good effect.

CASCARILLA.

What are its source, contents, and uses?

Cascarilla is the *bark* of *Croton eluteria*, a small tree of the West Indies. It yields its properties to alcohol and partially to water, and has an agreeable aromatic odor, most noticeable when burning. It contains a crystalline, bitter principle, *cascarillin*, a *volatile oil*, a *resin*, and some *tannic acid*. It is a pleasant aromatic bitter, well borne by the stomach, and may be used for the same indications as serpentaria. The dose of the powder is gr. xx–xxx. No officinal preparations.

CIMICIFUGA.

What are its source and contents?

Cimicifuga, or black snakeroot, is the *rhizome* and *rootlets* of *Cimicifuga racemosa*, an indigenous herb. Its exact status as to classification is not clear. It contains, however, a *volatile oil*, which gives to the plant its characteristic odor, *tannic* and *gallic acids*, a *resin*, and a not yet isolated active principle.

What effects does its administration produce?

The taste of the drug is bitter and slightly astringent, and in small doses it promotes the appetite and digestion. It slows the heart, and raises, and after large doses lowers, the arterial pressure, thus acting like digitalis, but much less powerfully. On the uterus and unstriped muscle it acts like ergot, but less energetically, increasing the muscular contractility of that organ. Anodyne and soporific properties are claimed for it. It undoubtedly increases the secretions of the skin and bronchial mucous membrane.

For what is it used?

As a stomachic bitter cimicifuga is used in *dyspepsia*, especially if *atonic* or *irritative;* as a cardiac tonic it may be an available succedaneum to digitalis; sedative and analgesic effects are claimed for it in *acute*

rheumatism and neuralgia; while by a tonic action on the unstriped muscular fibre it is probably of use in *congestive dysmenorrhœa*, *subinvolution of the uterus*, and *spermatorrhœa*. It is also a good expectorant in *bronchitis*.

Absinthium, the tops and leaves of *Artemisia Absinthium*, and **Magnolia**, the bark of different varieties of Magnolia, belong also to this class, but are seldom used.

ASTRINGENT BITTERS.

Cinchona and its alkaloids have already been discussed: they are very valuable stomachics in small doses.

CORNUS.

What are its source and constituents?

This drug is the *bark* of the *root* of *Cornus florida*, or dogwood, a small indigenous tree. The taste is bitter, astringent, and slightly aromatic. Its constituents are cornin, resin, and tannic and gallic acids.

What are its effects and uses?

It is a bitter, and is said to have antiperiodic effects as well. In too large doses it may prove irritant enough to cause gastric disorder.

Salix is the bark of *Salix alba* (white willow) and other varieties of Salix. It is chiefly of interest because of its neutral principle, *salicin*, which, as we have seen, is an antirheumatic and antiseptic.

PRUNUS VIRGINIANA (WILD CHERRY).

What is it, and upon what does its activity depend?

Wild cherry, officinally *Prunus Virginiana*, but more properly *P. serotina*, is an indigenous tree, the bark of which contains a *bitter principle*, *tannic* and *gallic acids*, *amygdalin*, and *emulsin*. Amygdalin is a glucoside which, with emulsin, a ferment, in the presence of water yields on distillation a volatile oil containing hydrocyanic acid. Emulsin is an albuminous substance, and is coagulated by heat, so that the value of the bark is impaired by boiling.

What are the preparations of wild cherry?

Prunus Virginianæ, powdered, dose ʒss–j.
Extractum Pruni Virginianæ Fluidum, dose ʒss–j.
Infusum Pruni Virginianæ, 4 per cent., dose ℥j–ij.
Syrupus Pruni Viginianæ, 16 per cent., dose ʒij–ℨss.

What are its effects and uses?

Wild cherry bark is a *somewhat astringent stomachic tonic*, and, owing to the hydrocyanic acid developed, a *nervous and circulatory sedative*. In the natural bark, however, this is present in a rather small percentage,

and most of the proprietary cough medicines are probably "fortified" with it. The syrup and the fluid extract are much used as vehicles, and possess a certain tonic sedative effect which renders them of value in phthisis.

DIURETICS.

Define diuretics.

Diuretics are remedies which increase the renal secretion, either by a direct stimulating effect on the secreting cells or by increasing the blood-pressure generally or locally. The ingestion of large amounts of fluid may also prove diuretic by flushing out the kidneys. It is to be borne in mind that the secretions of the skin and intestinal tract may be affected vicariously, and when a purely diuretic action is required these should be avoided; but in practice it ordinarily matters little how the fluid is eliminated.

SCILLA (SQUILL).

What is squill, and what are its constituents?

Squill is the *bulb* of *Urginea scilla*, a plant of the lily family whose habitat is the Mediterranean shores. These bulbs resemble onions in their appearance, and are found in the shops sliced and dried. Two varieties, the *red* and the *white*, are recognized, but they are of equal efficiency medicinally. Squill contains as active principles *scillipicrin*, *scillitoxin*, and *scillin*, and yields its activity to water, alcohol, and vinegar.

What preparations are officinal?

Pulvis Scillæ, dose gr. j–ij.
Extractum Scillæ Fluidum, dose ♏j–ij.
Tinctura Scillæ, 16 per cent., dose ♏x–xx.
Acetum Scillæ, 10 per cent., dose ♏xv–℥ss.
Syrupus Scillæ (♏xxv–gr. j), dose ℥ss–j.
Syrupus Scillæ Compositus ("hive syrup") contains squill and senega, āā. 6; tartar emetic, ¼ part in 100 = about gr. j to ℥j of tartar emetic; dose ℥ss–℥ss.

What are the physiological effects of squill?

In *small doses* squill increases the secretions of the bronchial and intestinal mucous membranes and of the kidneys, its diuretic action being the most constant, and probably due both to direct stimulation of the renal cells and to the increased blood-pressure which it causes. Whether the actual elimination of urinary solids is increased is not clear. In *larger doses* it is a *gastric* and an *intestinal irritant*, causing nausea, vomiting, and purging. In *toxic doses* it produces symptoms of severe gastro-intestinal and renal irritation—viz. violent vomiting, purging, and abdominal pain, *with bloody*, suppressed, and albuminous urine—collapse, and death.

What are the uses of squill?

This drug is used as a diuretic in conditions *not dependent upon nephritis*, in which condition it is distinctly contraindicated. Thus it is employed in *ascites*, in *chronic pleurisy*, or *pericarditis with effusion*, and in *cardiac dropsies*, in which it is combined with digitalis. Combinations of digitalis, squill, and calomel are much in favor in the above condition. Squill is also efficient as a blennorrhetic expectorant in subacute and chronic bronchitis, especially when the expectoration is viscid and tenacious.

What are the toxic dose and treatment?

Gr. xxiv. of squill have proved fatal. Sufficient has been said of the symptoms. The treatment consists in evacuation of the stomach if necessary, the free administration of opium and demulcents, with warmth and stimulation as necessity arises.

SCOPARIUS (BROOM).

What is scoparius, and to what does it owe its activity?

Scoparius is the *tops* of *Sarothamnus scoparius*, or common broom-plant, a native of Europe, but cultivated in this country. These dried tops have a strong, peculiar odor and a bitter, nauseous taste. Broom contains a neutral principle, *scoparin*—which by some authorities is considered unimportant, by others to represent its diuretic and purgative properties—and *sparteine*, an alkaloid already discussed under *Cardiants*. It has no officinal preparations, an extemporaneous decoction being most used.

What are its effects and uses?

In moderate doses scoparius is an efficient *hydragogue diuretic*, and in large doses may produce purgation and even vomiting. In *general dropsy* it proves a very valuable diuretic. Of a decoction (℥j to Oj boiled down to Oss) ℥j–ij may be given every two hours.

APOCYNUM (CANADIAN HEMP).

What are its active principles?

Canadian or *Indian hemp* is the *root* of *Apocynum Cannabinum*, an indigenous herb. It contains *apocynin*, *gallic and tannic acids*, a *bitter principle*, etc., and yields its virtues to both water and alcohol. The taste of apocynum is bitter, acrid, and nauseous. The powdered root alone is officinal. It is generally prescribed in infusion (℥ss to Oj of water or gin), the dose of which is ℥ij–℥ss.

What are its effects and uses?

Canadian hemp increases the secretions of the skin, bronchi, and kidneys, and in large doses is an intestinal irritant, causing vomiting and purging. In dropsy it proves a powerful remedy.

TRITICUM.

What are its main points of interest?

Triticum, or couch-grass, is the *rhizome* of *Triticum repens*, a perennial herb of Europe and North America. The rhizome has a sweetish taste, due to the presence of several sugars. Although only a *feeble diuretic*, it is of considerable value as a sedative to the genito-urinary tract, especially in *cystitis* with profuse mucous discharge. The best form of administration is in an *infusion* or *decoction*. Of the officinal fluid extract the dose is ʒss–ℨss.

VASCULAR DIURETICS.

What are vascular diuretics?

Drugs of this class produce diuresis by increasing the general arterial tension. Among them are such valuable diuretics as *digitalis*, *strophanthus*, and *caffeine*, which have already been fully treated of under *Cardiants*. Certain diaphoretics, to be later described, act, when the perspiration is lessened in any manner, to produce diuresis—*e. g.* jaborandi.

REFRIGERANT DIURETICS.

POTASSIUM.

What are the physiological effects of potassium salts?

Foremost among diuretics of this class are the acetate and citrate of potassium. As the effects of potassium salts are in a considerable measure due to the potassium element or modified by it, a good opportunity is here afforded for the study of these effects. *Locally*, some of the potassium salts, as potassa fusa, dissolve albumin and saponify fats, thus acting as caustics. Internally, they depress the spinal cord and lessen reflex excitability. They are all cardiac depressants, in *moderate* doses slowing the heart, while larger ones also lower arterial tension. Animals poisoned die by cardiac paralysis, the paralyzant effect being direct upon the heart-muscle. However, in ordinary medicinal doses, *small* doses, the effect is not so clear, and in man there is very little danger. Given in large or continued doses, they promote oxidation of the tissues, *markedly increase* the *urinary solids*, and if too long continued cause emaciation and perverted nutrition; the blood contains less fibrin, and the venous blood is lighter in color. After large doses of the *nitrate* or *chlorate* the hæmoglobin is decomposed, methæmoglobin is formed, and the oxidizing power of the blood is diminished.

Secretions.—The *acetate* and *citrate* of potassium, which are neutral at first, are partially oxidized in the blood, and are converted into *carbonates*—viz. *become alkaline after absorption*—and are said to be *alkaligenous*. These alkaligenous salts, and those whose solutions are already alkaline (*potassium hydrate*, *carbonate*, *tartrate*, and the *tartrate of sodium* and *potassium*), *increase the alkalinity of the blood*, *render the*

urine alkaline, and act as alkalies upon the glands with which they come in contact, increasing the activity of those whose secretions are acid, decreasing that of glands with alkaline secretions. The *nitrate*, *chlorate*, *sulphate*, and *bitartrate* have no such effect, being *permanently* acid or neutral.

In large doses potassa, or the chlorate, nitrate, or carbonate, causes vomiting, purging, and other symptoms of gastro-intestinal irritation, accompanied by more or less marked nervous symptoms and collapse. Elimination of potassium salts takes place largely by the urine. Some of the preparations of potassium require detailed notice.

POTASSIUM CARBONATE.

Describe it.

The carbonate of potash is prepared by purification of *pearlash*, which is an impure carbonate obtained from wood-ashes and other sources, or by calcining the bicarbonate of potash, thus depriving it of one molecule of CO_2 and reducing it to the carbonate. It is a coarse white, granular powder of alkaline reaction, freely soluble in water, and deliquescing in moist air to an oily liquid. It is chiefly employed as an *antacid* and *diuretic*. In large doses it is a corrosive poison, the antidotes for which are *oils* and *dilute acids*.

POTASSIUM BICARBONATE.

What is it?

This salt is made by passing CO_2 through an aqueous solution of purified pearlash until saturation is reached. It occurs as prismatic crystals, *permanent* in the air and easily soluble in water. The effects of this salt resemble those of the carbonate, except that it is better borne by the stomach, and it may be used as an *antacid*. It is a favorite in acute rheumatism and gout, in which conditions it is freely used up to ʒiss daily, with opium, if necessary, to relieve pain.

POTASSII ACETAS.

What are its properties, actions, and uses?

Acetate of potash is a white, extremely deliquescent salt, neutral in reaction, and very soluble in water. It is formed by evaporating a solution of the bicarbonate in acetic acid. As noted above, it is alkaligenous, alkalizing the blood and urine, promoting diuresis, and increasing the solids of the urine, with the exception of the uric acid, which is diminished by the increased oxidation. It constitutes one of the best forms of administration for the *alkaline treatment of acute rheumatism*, while in subacute forms combinations with the iodide of potash are valuable. In the acute form it should be given freely, ʒj–iss daily. It is also of service in *catarrhal jaundice* and *functional disorder of the liver*, as a prophylactic against uric-acid calculus, and by alkalizing the urine it

affords relief in *acute cystitis* and *urethritis*. It can be administered in lemon-juice.

POTASSII BITARTRAS.

What are its source, properties, effects, and uses?

This salt, also known as *cream of tartar* or *acid potassium tartrate*, is obtained by purifying *argol*, which is deposited during fermentation on the sides of wine-casks. It has an acidulous taste, is insoluble in alcohol, and only slightly soluble in water, in which, however, it may be easily dissolved by adding borate of sodium. It is the most active diuretic of the potash salts, and in large doses a hydragogue cathartic. It is chiefly used in *general dropsies of cardiac or renal origin*, in which its double action as diuretic and cathartic renders it particularly valuable.

POTASSII NITRAS.

What is the history of its formation?

This salt, *nitre* or *saltpetre*, is obtained from natural or artificial *nitre-beds*, in which it has been formed by the oxidation of ammonia and its subsequent combination with the bases of the soil. It is a crystalline substance of saline and rather cooling taste, soluble in 5 parts of water and insoluble in alcohol, and decomposing when heated, with the liberation of nascent oxygen.

What are the effects of nitre?

Applied to any raw surface or mucous membrane, salpetre acts as a decided irritant, and it is due to this property that poisonous effects more often follow its ingestion than that of other salts. The symptoms of poisoning are severe epigastric burning pain, violent vomiting, at times of blood, purging, followed very shortly by collapse and great muscular weakness. Nervous symptoms may or may not be pronounced as in other gastro-intestinal irritation. Suppression of urine may occur. The lesions at autopsy are intense gastro-enteric inflammation, often to the extent of ulceration of the mucous membrane. Although probably no more depressing to the heart than other potassium salts, aside from the depression secondary to this inflammatory condition, it does seem to produce more renal irritation. The treatment consists in giving opium and demulcents after evacuation of the stomach and bowels. It is now seldom used, and is chiefly of interest from its toxic effects. It was formerly thought to do good in rheumatism.

POTASSII CHLORAS.

What is its preparation? What are its effects?

This salt is prepared by various processes. It occurs as a white, anhydrous, fairly permanent salt, of a cool saline taste, and soluble in 16 *parts of water*. Absorbed, and to a very great extent at least elim-

inated in its own form, it does not differ decidedly in its effects from other potassium salts except in its irritant effects, which are similar to those of the nitrate. In poisonous doses it produces symptoms resembling those detailed under that drug. *In continued doses it is apt to produce chronic parenchymatous nephritis.* It does *not* give up its nascent oxygen at the body-temperature, as was once supposed, and experiments have shown that it is nearly all eliminated in its own form. Hence the theory of its oxidizing power is no longer held.

What are its uses?

Chlorate of potash has been extensively used in *diphtheria*, *scarlet fever*, and other conditions supposed to depend on a poisoned condition of the blood, and is still considered valuable by some. Locally, as a gargle or mouth-wash, it is of value in *simple and mercurial stomatitis*, *ozæna*, *subacute and chronic pharyngitis*, and fœtid ulcerations of the mucous membranes generally.

BLENNORRHETICS.

What are the effects and varieties of blennorrhetics?

Blennorrhetics are remedies which *promote secretions of mucous membranes*, and are used to restore a healthy action in cases of *deficient*, *abnormal*, or *excessive* secretion. They are principally employed in such conditions of the *bronchial* mucous membrane (expectorants) and of the *genito-urinary* tract (blennorrhetic diuretics).

BUCHU.

What is buchu, and what are its active principles?

Buchu is the *leaves* of *Barosma betulina;* habitat, Southern Africa. These leaves have a bitter taste and aromatic odor, contain a *bitter extractive* and a *volatile oil*, and yield their virtues to water and alcohol.

What are its effects and uses?

Buchu is slightly diuretic and a gentle stimulant to secretions generally, with a selective action on the urinary mucous membrane. It is used in chronic pyelitis, chronic cystitis, chronic urethritis, and may be made to act as a diaphoretic in cutaneous troubles. From its bitter principle it may prove tonic. The *fluid extract* is officinal (dose ʒj), but an *infusion* is the more ordinary way of administering it.

PAREIRA.

What is pareira? What are its effects and uses?

Pareira or Pareira brava is the *root* of *Chondodendron tomentosum*, a climbing plant of Brazil. It contains an alkaloid (cissampeline?), a resin, starch, etc. It imparts its activity to water, and the fluid extract

(dose ʒj) and extemporaneous infusions are the proper preparations for use. It is a mild *tonic*, *laxative*, and *diuretic*, and an efficient *corrective* to chronic inflammation or irritation of the bladder.

MATICO.

The leaves of *Artanthe elongata*, a Peruvian shrub. It contains resin, tannin, *volatile oil*, and a bitter principle, *maticin*. Matico is an aromatic tonic and a stimulant alterative to diseased mucous membranes, especially those of the bladder and bronchi. It has a reputation as a hæmostatic also. Dose of the powdered leaves, ʒss–iij; of extractum matico fluidum, ʒss–ij; and of the 10 per cent. tincture, ʒj–ij.

UVA URSI (BEARBERRY).

What is uva ursi? and what does it contain?

Arctostaphylos uva ursi is a shrub of this and other countries, the *leaves* of which are officinal. They contain *tannic* and *gallic acids*, a bitter *principle*, and *arbutin* or *ursin*, which is a glucoside and the active principle of the drug.

What are the effects and uses of arbutin?

Arbutin is a mild diuretic, with an alterative effect upon the mucous membrane of the genito-urinary tract. It is partially decomposed in the kidneys, with the production of *glucose* and *hydrochinon*, and partly eliminated unchanged. It asepticizes the urine and postpones decomposition. From its combined astringent, diuretic, and alterative effects it is of value in *chronic pyelitis* and *chronic cystitis*, and is especially efficacious as a palliative when the latter is due to enlarged prostate. It is said in some cases to prevent bleeding from the kidneys. The *fluid extract* (extractum uvæ ursi fl.) is officinal in ʒss–j doses.

JUNIPERUS (JUNIPER).

What is juniper and its oil? What are their effects and uses?

Juniperus is the fruit or so-called *berries* of *Juniperus communis*, a shrub of Europe naturalized in this country. These berries are of the size of a pea, and have a sweetish, aromatic taste resembling turpentine. They yield their activity, which depends upon a *volatile oil* (oleum juniperi), to boiling water and alcohol. Like other drugs of this class, the oil is *diuretic*, and, like oil of turpentine, is somewhat irritant to the gastro-intestinal tract, producing strangury and bloody urine when given in large doses. It may prove *emmenagogue*. The oil, which is officinal, is chiefly used as a vehicle for potassii bitartras and other saline diuretics, and for its own action in chronic pyelitis, cystitis, etc. The preparations are as follows:

Oleum Juniperi, dose ♏v–xv.

Spiritus Juniperi, 3 per cent. of the oil, dose ʒss–j.
Spiritus Juniperi Compositus (corresponds closely to Holland gin), dose ʒij–ʒss.

CHIMAPHILA.

What are chimaphila and its constituents?

Chimaphila umbellata is a small, indigenous, perennial plant, the *leaves* of which are officinal and contain *tannin*, *arbutin*, and other principles. Arbutin is its most active principle, and its effects and uses are therefore the same as those of uva ursi—viz. *tonic*, *slightly astringent*, and *diuretic*. Of the *fluid extract* the dose is ʒj or more.

OLEUM ERIGERONTIS.

What is this oil, and what are its effects and uses?

This oil, known also as *oil of fleabane*, is a *volatile oil* distilled from *Erigeron Canadense*, or Canada fleabane, and having properties much like oleum terebinthinæ. It is, however, weaker and more pleasant to the taste. It possesses *hæmostatic* and *diuretic* properties, and has been used in *chronic catarrhs of the genito-urinary organs*, in *dysentery*, and in *uterine hemorrhage;* dose gtt. v–xxx, frequently.

TEREBINTHINA (TURPENTINE); OLEUM TEREBINTHINÆ (OIL OF TURPENTINE).

Define a turpentine, and mention some of the varieties.

A *turpentine* is a liquid or semi-solid vegetable juice which contains *resin* and *oil of turpentine*. There are two officinal and several non-officinal turpentines: (1) *Common American white turpentine*, obtained chiefly from *Pinus Australis*, or yellow pine, growing chiefly in the Southern States; (2) *Canada turpentine*, also called Canada balsam, the product of *Abies balsamea*, or American silver fir, growing in the northern portions of North America. Among the non-officinal varieties are Bordeaux, Venice, and Chian turpentines.

What are the peculiarities of turpentines?

They are inflammable, insoluble in water, and quite soluble in alcohol and ether. By distillation, as stated above, they yield *resin* and *oil* of turpentine, both of which are officinal.

Oleum Terebinthinæ (Spirit of Turpentine).—This, the active principle of turpentine, is a colorless, volatile, inflammable liquid of a strong penetrating odor and hot pungent taste. It is insoluble in water, moderately soluble in alcohol, and freely so in ether. When exposed to the air it absorbs oxygen and converts it into ozone.

What physiological effects does turpentine produce?

Locally turpentine is a powerful irritant. Internally in medicinal doses

it produces gastric warmth, exhilaration, and a sort of intoxication: the pulse is increased in force and frequency. It is eliminated by the bronchi and kidneys, imparting its odor to the breath and an *odor of violets* to the urine. Poisoning by turpentine is rare, because in large doses the drug is eliminated by the bowel before absorption can take place. The symptoms produced by *too large doses* are abdominal burning, vomiting and diarrhœa, strangury, priapism, constant desire to urinate, suppression of urine or hæmaturia, complete unconsciousness, and a weak and rapid pulse. The lethal dose must be very large, and has not been determined. Its effects in detail are as follows:

Circulation and *respiration* stimulated by small and depressed by large doses.

Genito-urinary System.—After small doses few symptoms are produced except some increase in the amount of urine, with perhaps lumbar pain, frequent micturition, and burning pain in the urethra during the act: the effects of larger doses have been given above. Turpentine is eliminated by the bronchi and genito-urinary mucous membrane.

What are its uses therapeutically?

Locally, spirit of turpentine is much used as a counter-irritant *over large surfaces* in the form of turpentine *stupes*, which are best made by wringing out cloths in hot water and then in turpentine or sprinkling them with turpentine. Turpentine stupes are valuable in *bronchitis*, *abdominal pain*, and applied over the bladder will often relieve retention of urine, especially when of nervous origin. Turpentine in amounts of ʒj–ʒss is a valuable addition to enemata in cases where the rectum is impacted with fæces. *Internally*, it is used in *typhoid fever:* in two stages of this disease it is very valuable. In the second and third weeks the distressing tympanites may be markedly decreased by gtt. x. of the oil every three or four hours, its action being a local stimulation of the muscular coat of the intestinal wall, while in convalescence, which is protracted and accompanied by diarrhœa, in which case ulceration may be suspected, this drug is a valuable stimulant, promoting healing. In other *ulcers of the stomach* and *bowels* it acts locally in the same way. In *chronic pyelitis* and *chronic cystitis* it does good. In *impotence*, *spermatorrhœa*, and *gleet* due to relaxed conditions of the parts these conditions are not infrequently greatly benefited by moderate and continued doses. In *passive hemorrhages* from mucous surfaces, as *hæmaturia*, *purpura*, *scorbutus*, etc., it is quite generally useful. In adynamic conditions it is also useful as a general stimulant. Its use as a tæniacide will be mentioned later. In *flatulence*, *chronic intestinal catarrh*, and *subacute dysentery* it does good by stimulating peristalsis and by its supposed antifermentative action. Owing to its elimination by the bronchial mucous membrane it is used as a blennorrhetic expectorant in *chronic bronchitis* and *emphysema*, and may palliate in *gangrene of the lung.*

COPAIBA.

What is copaiba, and what are its physical and chemical properties?

Copaiba, or copaiva, is an *oleoresin* derived from the *Copaifera Langsdorfii*, a South American tree. It is a yellowish liquid of a peculiar terebinthinate odor and nauseous, burning taste. It is insoluble in water, but *soluble in alcohol, ether, and the fixed and volatile oils.* It is resolvable into a *volatile oil* and a *resin*, both of which are officinal. To call it a balsam is incorrect, as it contains no benzoic or cinnamic acid.

What are the preparations of copaiba?

Of copaiba itself the dose is ℥xx–xl.
Oleum Copaibæ, dose ℥x–xv.
Resina Copaibæ, dose gr. x–xv.
Massa Copaibæ (copaiba 94, magnesia to 100 parts), dose gr. x–xx.

What effects does it produce?

In *medicinal* doses copaiba produces no systemic effects. In *large* doses in susceptible persons it may cause fever, hot skin, gastro-enteric irritation, and not infrequently an *exanthematous eruption* very like measles. Its chief effects, however, are *local.* It is *diuretic*, the resin being even more so than the oil, and an *alterative* to the genito-urinary, and perhaps the bronchial, mucous membrane. Large doses in susceptible persons may produce strangury and renal irritation, even to the extent of hæmaturia. Under its use it is to be remembered that the urine gives with nitric acid a white precipitate resembling albumin, but differing from it in being soluble in alcohol. It is *slowly eliminated*, its constituents appearing in the urine for as much as four days after large doses.

What are its therapeutic indications?

Copaiba is chiefly used in *subacute* and *chronic inflammations* of the *genito-urinary tract.* In *gonorrhœa* it finds its great popularity, and is indicated in the subacute stages. During the acute it is too stimulating, although used by some. It is also used, as are the other drugs of this class, in *chronic pyelitis* and *cystitis*, and by some in chronic bronchitis and chronic diarrhœa. Ointments containing it often afford considerable relief in hemorrhoids.

How is it best administered?

Copaiba or its oil may be given in capsule or in an emulsion of some aromatic substance, the latter of which is said to agree better with delicate stomachs.

CUBEBA (CUBEB).

What can you say of cubeb and its properties?

Cubeb is the *unripe berries* of *Cubeba officinalis*, a climbing plant of Java and the East Indies. These berries have a characteristic aromatic

odor and a peculiar camphoraceous taste. Their important constituents are a volatile oil (oleum cubebæ) and two sorts of resin, the one hard and insoluble in ether, the other soluble in that menstruum and known as cubebic acid.

What preparations of cubeb are officinal?

Pulvis Cubebæ, dose ʒss–ij.
Oleum Cubebæ, dose ♏x–xxx.
Extractum Cubebæ Fluidum, dose ♏x–xl.
Oleoresina Cubebæ, dose ♏x–xv.
Tinctura Cubebæ, 10 per cent., ʒij–iv.
Trochisci Cubebæ, No. j.

What are its physiological effects?

Cubeb exerts a stomachic effect much like pepper, which after large doses becomes an active irritant. Medicinal doses do not produce much systemic effect, but large ones may be slightly stimulant to the circulatory function. Its *characteristic effect*, however, is stimulation of the mucous membranes, with a selective action on that of the genito-urinary tract. It is a *diuretic*, this property, it is said, residing in the *resin*, while a *carminative* effect is claimed for the oil. An eruption like that of copaiba may follow its use.

For what is cubeb used? How is it administered?

Its uses correspond very nearly with those of copaiba, with which it is often beneficially combined. It is less apt to derange digestion. Cubeb may be given in powder or syrup. The oleoresin nearly represents the drug and may be given in emulsion.

OLEUM SANTALI.

What are its points of interest?

Oil of santal- or sandal-wood is a yellowish, strongly volatile oil of a very characteristic odor, and obtained by *distilling the wood* of *Santalum album*, an East Indian tree. It is readily soluble in alcohol. It is used as a substitute for copaiba in *gonorrhœa*, succeeding best in the subacute stages, and is also of value in chronic bronchitis and chronic inflammations of the genito-urinary tract.

CATHARTICS.

What are cathartics, and how do they act?

Cathartics are drugs which act to *produce* or *increase* the evacuations from the bowels. They may act either by stimulating the glandular secretions of the mucous membrane or of the highly specialized glandular *organs, the* liver and pancreas, or by stimulating the muscular coat of

the intestine, and thus increasing the peristalsis. Different drugs have selective actions on different parts of the intestine.

How are cathartics classified?

Cathartics are classified, according to the vigor and method of their action, into *laxatives*, *salines*, *astringent resin-bearing purgatives*, *hydragogues*, and *mercurials*.

LAXATIVES.

What are laxatives?

Laxatives are cathartics which mildly produce evacuations, chiefly by an effect on the muscular coat and slightly on secretions. The following are thus classed:

Tamarindus, the preserved *pulp* of *Tamarindus Indica*, a large East Indian and African tree, dose ʒss–ʒj or more. It is an ingredient of confectio sennæ.

Manna, which is the concrete saccharine exudation in flakes of *Fraxinus ornus*, a Sicilian tree, contains a *resin* as its probable active principle, and *mannite*, a sugar. It is chiefly used for children because of its agreeable taste.

Sulphur, washed sulphur (sulphur lotum), is a mild laxative. It slightly increases the secretions, producing stools which are *soft* and very *offensive* from sulphuretted hydrogen gas (H_2S). It is valuable in painful anal diseases, as *fissures*, *hemorrhoids*, etc., to relieve the pain of defæcation. (See *Pulv. Glycerrhiz. Comp.*)

Oleum Ricini (castor oil) is an oil *expressed* from *Ricinus communis*, a tree of the East Indies, but cultivated as an annual plant in other latitudes. It is also obtained by decoction and by solution in alcohol, but the expressed oil is the best. It is a familiar amber-colored liquid of nauseating taste. It contains *palmitic* and *ricinoleic acids* (the latter peculiar to itself) and an unknown drastic element.

Castor oil acts in from four to six hours. It *stimulates peristalsis*, excites very slightly the glandular secretions, and is *not a cholagogue*. It has an *astringent after-effect*. It is used when a thorough evacuation, as of scybalous masses, is desired, and also in *diarrhœas* due to the ingestion of some irritating substance, and in *dysentery*. For these latter purposes it is combined with or followed by opium or some astringent. It is especially useful in *infantile diarrhœas*.

Magnesia, Magnesia Ponderosa, Magnesii Carbonas.—These preparations are all white powders, nearly insoluble in water, and may be classed with salines, than which, however, their action is much milder. They are *mild laxatives and antacids*. *Magnesia* is said not to be laxative except when combined with acids forming soluble salts, so that when this effect is desired it should be followed by an acid, as citric acid or lemonade.

Magnesia Ponderosa (or heavy magnesia), the dose of which is the same as magnesia, ʒss–ʒij, has the same effects.

Magnesium Carbonate is more sedative to the stomach from evolution of CO_2 gas. Although laxative, the chief use of these magnesia preparations is as *antacids.*

Pulvis Glycerrhizæ Composita contains senna 18, sulphur lotum 8 parts, with licorice, fennel, and sugar to 100 parts. The senna and sulphur are its active principles, while fennel acts as a mild antispasmodic. It is a deservedly popular laxative, but may cause griping.

Cassia Fistula is the *pulp* of the long pods of *Cassia Fistula*, an Egyptian tree; it is chiefly used as an ingredient of confectio sennæ.

Oleum Olivæ, Oleum Amygdalæ Expressum, and **Oleum Lini** are laxatives, but are chiefly used in laxative enemata. The last may be used by mouth.

SALINES.

How do they act?

They increase both secretions and peristalsis, producing loose, watery stools, with very slight irritation and without systemic depression. They act fairly quickly, especially if taken on rising. Their purgative action is due *slightly to increased peristalsis,* but chiefly to *increased secretion* and to a *free outward* osmosis of the body fluids, which is not a true secretion of the glandular apparatus.

What are the most important salines?

Magnesii Sulphas (sulphate of magnesia or sal Epsom) is a white, slowly-efflorescent salt, very soluble in water, and having a nauseating bitter taste, although fairly well borne by the stomach; dose ʒij to ℥j.

Liquor Magnesii Citratis, the dose of which is ℥vj–xij, and **Magnesii Citras Granulatus,** in doses of ʒj to ℥ss, are also much used. The former is effervescent from the reaction of citric acid and bicarbonate of potash, and is a pleasant and mild cathartic. The latter is a coarsely granular powder, deliquescent on exposure to the air, and soluble, with free effervescence, in water. It should be kept in closely-corked bottles.

Potassii et Sodii Tartras (sal Rochelle) occurs as slightly efflorescent crystals, of mildly saline and bitter taste, and freely soluble in water; dose ℥ss–j. It is frequently prescribed in the pulv. effervescens comp., or Seidlitz powder, which consists of sal Rochelle ʒij and sodii bicarb. gr. xl in the *blue,* and tartaric acid gr. xxxv in the *white* paper, to be dissolved in water and taken while effervescing.

In what conditions are salines useful?

In *ascites, renal,* and *cardiac dropsies* salines are very valuable by producing watery transudation from the intestines and lessening the work of the kidneys. They are especially efficacious in ascites if pressure be not too great; in uræmia, œdema of the brain, and cerebral hyperæmia, as depletants. In dysentery sal Epsom and sal Rochelle are much used. *They lessen the* hyperæmia of the mucous membrane and cause fæcal

evacuations, with a decrease of pain and distressing tenesmus. After abdominal operations, when the temperature is rising, they assist in the removal of deleterious matter, and do good by depletion, and are now commonly employed by most laparotomists. In so-called fæcal anæmia, or anæmia with constipation, they are advantageously combined with iron.

What special uses has magnesium sulphate?

In lead constipation, lead colic, and saturnine cachexia the sulphate of magnesium is very valuable to prevent the *reabsorption* of the lead from the bile, in which it is largely excreted. It accomplishes this by forming the insoluble lead sulphate, $PbSO_4$.

In carbolic poisoning this and other soluble sulphates form insoluble sulphocarbolates and prevent absorption.

Name other members of this group.

Other unimportant members of this group and their doses are—

Sodii Sulphas, sulphate of soda or Glauber's salt, an ingredient in many mineral waters, ℥ss or less.

Sodii Phosphas (phosphate of soda), dose ʒvj–℥iss.

Potassii Sulphas (sulphate of potassium), dose ʒss–ij.

Potassii Bitartras (or cream of tartar), a good diuretic, but weak laxative; dose ℥ss–j.

Few of these salines are now used as laxatives.

ASTRINGENT RESIN-BEARING PURGATIVES.

These drugs act strongly in both ways—viz. increasing both secretions and peristalsis—but do not produce inflammatory changes. The group includes several important purgatives.

RHEUM (RHUBARB).

What is it? and what is known of its composition?

Rhubarb is the *root* of *Rheum officinale* and other varieties of Rheum. Its composition is not yet fully determined. It contains a resinous body, chrysophanic, rheumic, and rheotannic acids, to the last of which is due its astringent after-effect.

What are its preparations?

Rheum, powdered, dose gr. v–xx.

Pilulæ Rhei, each = gr. iij.

Extractum Rhei, dose gr. v–x.

Extractum Rhei Fluidum, dose ♏v–xxx.

Pilulæ Rhei Compositæ, containing in each rheum gr. ij, purified aloes gr. jss, myrrh gr. j, and ol. menth. piper. gr. $\frac{1}{10}$; No. j–iij.

Pulvis Rhei Compositus (Gregory's powder), dose ʒss–j.

Tinctura Rhei, dose ʒj–ij.

Tinctura Rhei Aromatica (rhubarb 20 per cent., with cinnamon, cloves, and nutmeg), dose ʒss–j.

Tinctura Rhei Dulcis (rhubarb 8 per cent., with licorice, anise, and cardamom), dose ʒij–iv.

Syrupus Rhei, dose ℥ss–j.

Mistura Rhei et Sodæ (contains of ext. rhei fl., sodii bicarb, and spts. menth. pip. 3 per cent. each), dose ℥ss–ij.

Vinum Rhei, dose ʒj–ʒss.

What are its physiological effects?

In small doses rhubarb is a *tonic astringent* and *stomachic;* in sufficient amount (gr. iv–vj) a *slow* and *mild cathartic*, only occasionally causing griping. It increases the secretions of the intestinal mucous membrane, and is a *cholagogue*, the last-named action being probably due to its resin, *phœoretin*.

In what conditions is rhubarb of value?

In *intestinal dyspepsia* due to deficiency of the intestinal and hepatic secretions small doses do good; in *jaundice* from *catarrh of the duodenum* or *bile-ducts*, especially when occurring in children; in *summer diarrhœa* it has a secondary astringent effect, and nothing is more often used than the aromatic syrup or one of the tinctures.

SENNA.

Give its source and composition.

Senna consists of the *leaflets* of *Cassia acutifolia* and *C. elongata*, shrubs of Egypt and Arabia. Its activity resides in a glucoside, *cathartic acid:* it also contains *chrysophanic acid* and other substances not well understood.

Give its preparations.

Confectio Sennæ contains senna 10 per cent., with tamarind, cassia fistula, prunes, etc.; dose ʒj–ij.

Extractum Sennæ Fluidum, dose ʒj–iv.

Infusum Sennæ Compositum ("black draught") contains senna 6 per cent., manna and mag. sulph. *āā*. 12 per cent.; dose ℥iv.

Syrupus Sennæ, dose ʒj–iv.

Pulvis Glycerrhizæ Composita (for which see *Laxatives*), dose ʒss–ij.

What are the effects and uses of senna?

Senna is a *prompt* and efficient cathartic, acting in about *four hours* to produce copious liquid stools, without any irritation. It is probably slightly cholagogue, and increases the secretion of the whole intestinal canal. It has a slight tendency to produce griping. Its uses are those of the class to which it belongs.

ALOE (ALOES).

What is aloes?

Aloes is the *inspissated juice* of *Aloe Socotrina* and other varieties of aloe which are not officinally recognized. Three sorts are known to commerce: Cape, Socotrina, and Barbadoes aloes. It contains, as its active principle, a neutral substance, *aloin* (dose gr. ¼–ij), which may vary slightly in different varieties of aloes; also a resin, which is not purgative when pure.

What are its preparations?

Aloe,
Aloe Purificata, } dose gr. ij–xv.

Extractum Aloës Aquosum, dose gr. j–v.

Pilulæ Aloës, each = gr. ij.

Pilulæ Aloës et Asafœtidæ: one pill contains gr. 1⅓ of each.

Pilulæ Aloës et Ferri, aloes and dried sulphate of iron, of each gr. j, with aromatic powder; used in amenorrhœa.

Pilulæ Aloës et Mastiches (Lady Webster's dinner pill), aloes gr. ij, mastic and red rose *āā*. gr. ½ in each pill.

Pilulæ Aloës et Myrrhæ, aloes gr. ij, myrrh gr. j, and aromatic powder gr. ½ in each pill.

Tinctura Aloës, 10 per cent., dose ʒss–ij,
Tinctura Aloës et Myrrhæ, dose ʒj–ij, } seldom used.
Vinum Aloës, dose ʒj–iij,

What are the effects and uses of aloes?

Aloes is a *very slow cathartic* (ten to twelve hours), *acting mostly on the peristalsis of the large intestine*, but in large doses increasing the secretions of the liver and mucous membranes. It is said to cause congestion of the pelvic viscera. It is a favorite in intestinal dyspepsia with torpidity of the liver and of the muscular coat of the intestinal wall.

CASCARA SAGRADA.

What is cascara sagrada?

Cascara sagrada (non-officinal in 1880) is the *bark* of *Rhamnus purshiana*, or California buckthorn.

How does it act?

Cascara is a particularly good stimulant of peristaltic action, especially that of the lower bowel. It also exerts a tonic effect on unstriped muscle. Hence it has become a standard remedy in chronic constipation. Of the *fluid extract* ♏x–ʒss may be given two or three times daily, beginning with the smaller dose and giving just enough to produce a free morning evacuation. It has a tendency to produce griping, and may be advantageously combined with belladonna or hyoscyamus to prevent this.

FRANGULA.

What can you say about frangula?

Frangula is the *bark of Rhamnus frangula*, or alder buckthorn. When *green* it has an *emetic tendency*. When dry it is cathartic and diuretic, and also an anthelmintic of value; dose of *fluid extract* ʒss–j.

Juglans is the *inner bark* of *J. cinerea* (butternut); extract officinal.

Leptandra is the *rhizome* and *rootlets* of *L. Virginica*, or Culver's physic; the *extract* and *fluid extract* are officinal.

DRASTIC PURGATIVES (HYDRAGOGUES).

How are these defined?

Drastics, or hydragogues, act very powerfully both upon the secretions and peristalsis, the more powerful and active of them producing in large doses severe gastro-enteritis and poisoning.

JALAPA (JALAP).

What are its source and composition?

Jalap is the *tuberous root* of *Exogonium purga*, a Mexican plant. Its activity resides in a *resin* which is officinal, and consists of two portions, both cathartic, the one soluble in ether, the other insoluble. The latter is known as *convolvulin*, and is probably the more active.

What preparations are used?

Jalapa, powdered, dose gr. xv–ʒss.

Abstractum Jalapæ, dose gr. v–xv.

Pulvis Jalapæ Compositus (about one-third jalap, two-thirds potassium bitartrate), used as cathartic and diuretic; dose ʒss–j.

Resina Jalapæ (see above), dose gr. ij–v.

Pilulæ Catharticæ Compositæ. (See *Colocynth.*)

What effects are produced?

Jalap is a powerful hydragogue cathartic, acting very promptly. It is an hepatic stimulant, markedly increases the secretions of the intestinal glands, producing large watery stools, and may cause griping. It is much used in *ascites*, *general dropsy*, and *threatened uræmia*, the compound jalap powder being a favorite prescription.

PODOPHYLLUM (MANDRAKE).

What is its source and composition?

Podophyllum is the *rhizome* and *rootlets* of *Podophyllum peltatum*. The officinal *resin* is an alcoholic extract of the root, and contains, besides *berberine*, two resinous cathartic principles—one neutral, the other acid in reaction.

What are its preparations?

Pulvis Podophylli, dose gr. xv–xx.
Abstractum Podophylli, dose gr. v–x.
Extractum Podophylli, dose gr. i–ij.
Extractum Podophylli Fluidum, dose ♏v–xv.
Resina Podophylli (note the dose), dose gr. ⅛–j.

What are its effects and uses?

Mandrake is a *powerful hydragogue cathartic*, but *slow* in its action; also an *hepatic stimulant*, and has a tendency to act upon the *upper intestinal tract*. Hence it is useful in *intestinal indigestion* and *constipation* dependent on *deficient hepatic secretion* and *torpidity of the intestinal wall*, in *portal congestion*, *jaundice*, and *ascites*.

CHELIDONIUM.

What is chelidonium?

Chelidonium is the *herb* of *Chelidonium majus*. It has no officinal preparations and no therapeutic importance. It is a hydragogue cathartic, and is said to be narcotic.

IRIS.

What are the source, active principle, and preparations of iris?

Iris is the *rhizome* and *rootlets* of *Iris versicolor*, or blue flag. It contains a resin, to which is probably due its activity. Iris stimulates the hepatic secretion and that of the intestinal glands, and in large doses causes violent vomiting and purging, with depression. It is used in (1) jaundice, especially of malarial origin; (2) functional disturbance of the liver (torpidity so called); (3) intestinal dyspepsia; and (4) dropsy. The following preparations are officinal:

Pulvis Iridis, dose gr. v–xv.
Extractum Iridis, dose gr. i–ij.
Extractum Iridis Fluidum, dose ♏iij–x.

EUONYMUS.

What are its source, composition, etc.?

Euonymus, or wahoo, is the *bark* of *Euonymus atropurpureus*, a native shrub. It contains *euonymin*, a resin, etc. It produces a powerful stimulation of the hepatic secretion, and to a less extent of the intestinal, and may be, but seldom is, used for this purpose. An extract is officinal, the dose of which is gr. i–ij.

SCAMMONIUM.

How is it used?

Scammony is a *resinous exudation* from the *root* of *Convolvulus scammonia*, a Syrian vine. A resin called *scammonin* constitutes 80 to 90

per cent. of its weight, and is colorless, tasteless, and soluble in alcohol and ether. It is a powerful hydragogue cathartic, and seldom used alone. Of the drug the dose is gr. v–x; of its *resin*, which is officinal as resina scammoniæ, gr. iij–vj. It is most used in the compound extract of colocynth, of which this resin constitutes 14 per cent.

COLOCYNTHIS.

What are its source and composition?

Colocynthis (genitive *colocynthidis*) is the *fruit* of *Citrullus colocynthis*, or bitter cucumber. It yields its active principle to water and alcohol, and contains a *resin*, colocynthin, a glucoside (?), and colocynthitin.

What preparations are important?

Extractum Colocynthidis, dose gr. ij–v.

Extractum Colocynthidis Compositum (contains of the extract 18, aloes 50, resin of scammony 14 parts, with cardamom and soap to 100 parts), dose gr. j–xv.

Pilulæ Catharticæ Compositæ, a pill in very common use; contains of the above compound extract gr. $1\frac{1}{3}$, abstract of jalap and calomel āā. gr. j, and gamboge gr. $\frac{1}{4}$.

What are the effects and uses of colocynth?

Even in very moderate doses this drug is a gastro-intestinal irritant, a powerful cholagogue, and a hydragogue. Owing to its liability to cause inflammation, it is used only in combinations, chiefly as the compound extract, which is a safe and efficient purgative.

CAMBOGIA.

What are its source and only officinal preparation?

Camboge (or more properly gamboge) is a *gum-resin* procured from *Garcinia Hanburii*, a tree of Siam. It is composed of about 80 per cent. of resin, is officinal only in the compound cathartic pill, of which it constitutes 10 per cent., and is a gastro-intestinal irritant and hydragogue cathartic, but not an hepatic stimulant.

ELATERINUM.

What is it?

Elaterin is the active principle of elaterium, a substance deposited from the *juice of the fruit* of *Ecballium elaterium*, or squirting cucumber.

What are its properties, effects, and uses?

Elaterin occurs in colorless, odorless, bitter crystals, insoluble in water and readily soluble in alcohol. It is a very violent hydragogue, powerfully irritant, and may cause death. It is also slightly diuretic. It is used in uræmia and as a revulsive in cerebral affections, also in general dropsy and ascites, but is unsafe. Dose of elaterin gr. $\frac{1}{20}$–$\frac{1}{12}$; of tritu-

ratio elaterini, which was the only officinal trituration in the U. S. P. of 1880, the dose is gr. ¼–j.

OLEUM TIGLII (CROTON OIL).

What is croton oil?

This drug is a *fixed oil* from the *seeds* of *Croton Tiglium*, an East Indian shrub. The oil of the shops is a mixture of the *fixed oil proper*, a *resin*, and *tiglinic acid*. The purgative principle has not been isolated. A principle called *crotonol* is said to produce the irritant effects upon the skin. It is a viscid, reddish-brown liquid, with a slight peculiar odor and bitter acrid taste. It is soluble in ether and slightly so in alcohol.

What are its effects in medicinal and large doses locally?

In doses of gtt. j–iij it is a very powerful hydragogue cathartic, acting slightly also as a diuretic. Larger doses, unless vomited, may cause fatal gastro-enteritis. It is unreliable, however, and at times large doses may not affect the bowels. It is the quickest of cathartics, often taking effect in from one-half to two hours. Locally applied, it causes a vesicular and pustular eruption somewhat resembling that of small-pox.

What are its uses?

It is extremely valuable as a revulsive cathartic in cerebral and uræmic conditions when swallowing is difficult or impossible (gtt. ij–iij dropped on the tongue or taken in bread-crumb), and may be useful in very obstinate constipation and in severe dropsies if the general condition be good.

MERCURIAL CATHARTICS.

What preparations of mercury are here considered?

Hydrargyri Chloridum Mite (calomel), dose gr. $\frac{1}{10}$–xx.
Massa Hydrargyri (blue mass), dose gr. $\frac{1}{10}$–xx.

What peculiar features do mercurial cathartics possess?

The purgative action of these mercurials is characteristically *slow*, ten to twelve hours elapsing before catharsis is produced. They are also *uncertain* in their action, and are often used in combination with or followed by other cathartics, generally salines. They act by *increasing the flow of bile into the intestine*, and by increasing the secretions of the mucous membrane and pancreas. Whether an actual increase in *bile-production* occurs is doubtful, their probable effect being to cause the gall-bladder to empty itself by reflex irritation. Thus they are called by Bruce *indirect cholagogues*. Frequently repeated small doses (gr. $\frac{1}{10}$ to ¼) are given when exhibited with the view of acting on the liver. *Blue mass* resembles calomel in its action, but is weaker and more uncertain, and is seldom now used as a cathartic.

What are the uses of calomel?

Calomel is used as a purgative when there is a deficiency of bile in the intestine. In small repeated doses (gr. $\frac{1}{10}$–$\frac{1}{2}$) it will often check obstinate vomiting. It was formerly, and is still occasionally, used as an *antiphlogistic*. It has mild *diuretic* and *anthelmintic* properties.

ANTHELMINTICS.

What are anthelmintics? Vermifuges? Vermicides?

Anthelmintics are remedies which promote the expulsion of worms from the intestinal tract; *vermifuges* expel parasites; *vermicides* kill as well as expel them. They act in one of three ways: (1) mechanically; (2) by some intoxicating influence; (3) by an actual poisonous effect.

What are the parasites against which they are directed?

The parasites which we are ordinarily called upon to treat are—(1) *Ascaris* or *Oxyuris vermicularis*, the so-called "seat-worm," which inhabits the large intestine, especially the rectum, and in females the vagina; (2) *Ascaris lumbricoides*, or "round-worm," which exists in all parts of the alimentary tract; and (3), most important of all, *Tæniæ*, of which three varieties are known—*Tænia solium*, *Tænia mediocanellata*, and *Tænia bothriocephalus latus*. The first two are by far the most common in this country.

What is the treatment for oxyuris?

For the expulsion of this parasite *enemata* of the following are available and efficacious: (1) infusions of quassia; (2) decoction of aloes; (3) weak solutions of carbolic acid; (4) plain water or salt and water frequently repeated. As a safeguard against auto-infection by mouth from the fingers strict cleanliness of the hands must be enforced. For the *Ascaris lumbricoides* the following remedies are employed:

SANTONICA.

What are its source and composition?

Santonica is the unexpanded *flowers* of *Artemisia maritima*, or Levant wormseed; habitat, Persia and Asia Minor. Among other elements it contains a neutral principle, crystalline, colorless, odorless, and *practically insoluble in water*, called *santonin*, which represents the virtues of the drug.

Preparations and doses of santonica?

Pulvis Santonicae, dose gr. x–ʒss.
Santoninum, dose gr. ¡ wo years old, gr. ¼–½.
Sodii Santoninas.
Trochisci Sodii S r. j.
The santoninat to employ as *a vermifuge*.

What are its effects? and what is its principal use?

In ordinary medicinal doses santonin produces no obvious effects. Large doses may cause *gastro-enteric irritation* and *chromatopsia*. Objects in the visual field are generally colored yellow, but occasionally green, blue, or even red. The urine is colored yellow. Toxic doses cause severe cerebral symptoms, but such toxic effects are rare. The only use of santonica and its principle, santonin, is in the expulsion of the round-worm. For this purpose it should be given on an empty stomach and followed by a brisk cathartic.

SPIGELIA.

What are its source and preparations?

Spigelia, or pinkroot, is the *rhizome* and *rootlets* of *Spigelia marilandica*, the Carolina pink. The dose of the powdered root is ʒj–ij. An *extract* is officinal in doses of ʒj–ij.

What are its effects and uses?

The effects of this drug correspond closely to those of santonin, except that no visual symptoms are produced. By some it is considered the best remedy for the round-worm. The method of administration is the same as for santonin.

Chenopodium.—Chenopodium, or American wormseed, is the fruit of *Chenopodium anthelminticum*, an indigenous plant. It is a very efficient remedy for this purpose. Oleum chenopodium is the only preparation used; dose gtt. v–xv; for a child of two years, gtt. iv–viij.

Azedarach.—This drug is the *bark* of the root of *Melia azedarach*, or bead tree, of Syria, Persia, and India. It is said to somewhat resemble spigelia. It possesses no officinal preparations, but repeated doses (ʒss–j) of a *decoction* over a period of some days are claimed to be effectual.

What preliminary measures are necessary to expel tæniæ?

In the treatment of tæniæ the preliminary measures are as important as the drugs themselves. The patient should fast for from twenty-four to forty-eight hours, and a thorough purgative should be taken. Then the drug selected should be administered, followed in a few hours by another brisk cathartic. No case is to be considered cured until the head is discovered by a microscopic examination.

The following drugs are used to expel tæniæ:

ASPIDIUM.

Give its source, composition, and preparation.

Aspidium, or male fern, is the *rhizome* of *Aspidium filix mas* or *Aspidium marginale*, the former a plant of Europe, the latter indigenous. Its activity is supposed to depend on *filicic acid*, which can be extracted with ether. The other constituents are unimportant. Used

with the preliminaries mentioned above, it is an efficient remedy against all tæniæ. Dose of the oleoresin, ℥ss–ij.

GRANATUM.

What are its important features?

Granatum is the *bark* of the root of *Punica granatum*, or pomegranate. Its active principle is *pelletierine*, or pelleterine, which is also used, and is of equal efficiency. Pomegranate causes some intestinal disturbance, and generally purges, failing in which it should be followed by a brisk cathartic. It is a very certain tæniafuge, and is generally administered in the form of a decoction of the fresh root. Of pelletierine the dose is gr. iij–v; in larger doses its effects are said to somewhat resemble curare.

KAMALA.

What is kamala?

Kamala, or rottlera, consists of the *glands* and *hairs* from the capsules of *Mallotus Philippinensis*, a small tree of Asia, Australia, and elsewhere. It imparts its virtues to alcohol, and, having no officinal preparations, may be used as a tincture. It is fairly efficient. The dose of the powder is from 1 to 2 drachms.

BRAYERA.

What is brayera?

Brayera, or kousso (cusso), is the *female inflorescence* of *Brayera anthelmintica*. Its efficiency as a tæniafuge is doubtful, and its popularity is waning. Dose of the powder ℥ss; of the *fluid extract* ℥ss–jss; of a 6 per cent. infusion ℥viij.

PEPO (PUMPKIN).

What are its value and administration?

Pepo, or pumpkin-seed, is derived from *Cucurbito pepo*. It is one of the most efficient anthelmintics. It is given in ℥ij–iv doses of the seeds pounded in a mortar with some excipient or made into an infusion. With proper preliminary precautions failure seldom attends its use.

Mention some other remedies used for this purpose.

Oleum Terebinthinæ, in doses of ℥j–ij, may be used and is effective, but has the disadvantage of sometimes causing symptoms of genito-urinary irritation.

Cocoanut.—The milk and meat of two cocoanuts, taken raw after the usual preparations (see above), have recently proved efficient, perhaps from their mechanical effects.

Ailanthus, a non-officinal drug, the oleoresin or a decoction of the fresh bark of which may be employed.

EMETICS.

What are emetics? and for what purposes are they used?

Emetics are medicines employed to produce vomiting (emesis). They may be either *local* or *general*.

Local or reflex emetics are drugs which by locally irritating the gastric filaments of the vagus institute an impression which is transmitted to the vomiting centre in the medulla, and thus establish *reflex vomiting*. *Systemic* or *general* emetics act *directly* upon the vomiting centre in the medulla after absorption into the blood.

What circumstances modify their activity?

Their activity is increased when fever or gastritis obtains—decreased, often decidedly, in cerebral disease or narcotic poisoning.

What are the indications and contraindications for emetics?

Emetics are used to empty the stomach of deleterious substances, as poisons, etc.; to forcibly expel substances from the pharynx and œsophagus; to relax spasm, as in laryngismus stridulus and in certain hysterical conditions; as nauseants to increase secretions. They are contraindicated in pregnancy, hernia, and cerebral endarteritis.

LOCAL EMETICS.

These comprise certain metallic salts, chiefly sulphates, and certain vegetable drugs.

What are the principal metallic local emetics?

Cupri Sulphas (copper sulphate, *blue stone*, or *blue vitriol*), gr. v, repeated if necessary in fifteen minutes, is a prompt emetic, and produces only slight depression; it is especially valuable in *narcotic* and *phosphorous* poisonings, in the latter of which it is antidotal as well as emetic.

Zinci Sulphas (zinc sulphate, or *white vitriol*) corresponds to the above sulphate in doses of gr. x–xx, and is considered by some safer and more prompt; it is not antidotal to phosphorus.

Alumen (alum, sulphate of aluminium and potassium), ʒj in syrup, acts as a safe but slow emetic (one-half to three-quarters of an hour).

Hydrargyri Subsulphas Flavus (turpeth mineral), dose gr. ij–v; it is tasteless, and produces emesis with very little nausea and only moderate depression; used in croup, and quite slow in its action.

Name the principal vegetable local emetics.

Sinapis Alba or **Sinapis Nigra** (white and black mustard), ʒj–ij in water, causes emesis without prostration. Indeed, it is a cardiac and respiratory stimulant. Its chief advantage, however, lies in the fact that it so generally available.

Syrupus Scillæ Compositus, containing tartar emetic (gr. ¡ to ʒij),

senega, and squill, is much used as a nauseant and emetic in doses of ℥x–℥ss; known also as hive syrup.

What other measures may at times be valuable?

Mechanical irritation of the pharynx with a feather or a finger, unless its sensibility be too much obtunded, will produce vomiting. Tepid water in large draughts may often prove valuable when other means are not at hand.

SYSTEMIC EMETICS.

IPECACUANHA (IPECAC).

What are its source and active principles?

Ipecac is the root of *Cephaëlis Ipecacuanha*, a small shrubby plant of Brazil. It contains an alkaloid, *emetine*, as its active principle, in combination with *ipecacuanhic acid*.

What preparations are officinal?

Pulvis Ipecacuanhæ, dose gr. ¼–℈ss.
Extractum Ipecacuanhæ Fluidum, dose ℥¼–℈ss.
Pulvis Ipecacuanhæ et Opii (Dover's powder). See *Opium*.
Trochisci Ipecacuanhæ; seldom used; each = gr. ½.
Trochisci Ipecacuanhæ et Morphinæ; each = gr. $\frac{1}{12}$, with morph. sulph. gr. $\frac{1}{40}$.
Tinctura Ipecacuanhæ et Opii. See *Opium*.
Syrup Ipecacuanhæ, 5 per cent. of fluid extract; dose ℥x–℈ss.
Vinum Ipecacuanhæ, 7 per cent. of fluid extract; dose ℥x–℈ij.

What are the physiological effects of ipecac?

This drug may well be considered in its entirety in this connection, although it has other uses and actions than as an emetic. Locally, it is an irritant to the skin and mucous membranes. In small doses it is a stomachic tonic. Larger doses increase the secretions of the salivary glands, bronchi, stomach, skin, and liver, the bile being unaltered in its composition. The circulation is but little affected, but the respiration is slightly depressed and the surface temperature is lowered. It acts as a mixed emetic, both influencing the medulla and irritating the terminal filaments of the vagus. For this purpose the dose varies (gr. iv to xx), and it is preferably given in small repeated doses until emesis is produced. It is very mild and certain in its emetic action.

What important uses does it fulfil therapeutically?

Ipecac is used as an emetic, stomachic, tonic, antiemetic, and blennorrhetic expectorant. As an *emetic* it is used in gastric irritation caused by indigested food; in sick headaches and acute indigestion, which may often be cut short; in membranous croup, laryngismus stridulus, lodgment of foreign bodies, etc. for its mechanical effect.

As a stomachic tonic it is a favorite in doses of gr. $\frac{1}{10}$–$\frac{1}{6}$ in combina-

tion with other drugs. In the same dosage it is also valuable to check vomiting, the cases in which it succeeds being of nervous origin, as the vomiting of pregnancy, sea-sickness, sick headache, etc. As an expectorant in hay fever and in the acute stages of coryza and bronchitis it does good by increasing the secretions. Empirically, ipecac has been found valuable in *acute dysentery:* large doses (gr. x–xx), combined with opium until tolerance be established that it may be retained, ameliorate the tenesmus and abdominal pain and give the patient great relief, and have seemed to decrease the mortality of epidemics. It is also employed in *chronic dysentery* and *diarrhœal diseases.* If no good effect be produced after a trial of two or three days, it is best abandoned. Carried to the point of producing nausea, it seems to have antihemorrhagic powers, and is especially recommended in *uterine hemorrhage* and *hæmoptysis.*

What is its administration as regards antagonists and synergists?

The *tannate of emetine* is extremely insoluble; hence tannic acid and drugs containing it should not be combined with it. Lead and mercury salts and vegetable acids are also incompatible. It is assisted in its action by all emetics and nauseants.

APOMORPHINA (APOMORPHINE).

What is apomorphine?

Apomorphine is morphine from which one molecule of water has been taken by heating morphine and hydrochloric acid under pressure. It occurs as a white powder, readily absorbing moisture from the air and becoming green in the process. *Apomorphinæ hydrochloras* is officinal, and is easily soluble in water.

What are its effects and uses?

This salt is our best example of a *purely systemic emetic*, acting equally well by stomach or hypodermic exhibition, and acting promptly (generally in from five to twenty minutes), with frequent repetition of the vomiting, which occurs with but little nausea. It depresses the circulation and respiration, and in fatal doses causes death by respiratory paralysis. After large doses convulsions followed by paralysis may ensue. All these effects are *entirely centric.* Its only use is as an emetic (gr. $\frac{1}{8}$ by mouth, gr. $\frac{1}{16}$ by hypodermic injection), and it may be used when sudden emetic action is desired or when swallowing is difficult or impossible, but does not succeed well in profound narcosis.

SANGUINARIA.

What are its source and composition?

Sanguinaria, or blood-root, is the *rhizome* of *Sanguinaria Canadensis*, and may be classed as an emetic. It yields its virtues, which reside in

an alkaloid, *sanguinarine*, to both alcohol and water, and deteriorates by keeping.

What are its preparations?

Acetum Sanguinariæ, 10 per cent., dose ♏x–xxx.
Extractum Sanguinariæ Fluidum, dose ♏iij–v.
Tinctura Sanguinariæ, 16 per cent., dose ♏x–xx.

What are the physiological effects of sanguinaria?

Locally, it is a decided irritant, causing violent sneezing when inhaled, and acro-narcotic poisoning when taken by the stomach in large doses: it exerts an escharotic action upon fungous granulations. Large doses cause collapse, with coldness of the surface, cold sweating, dilated pupils, and diminished reflexes; they depress the circulation and respiration and cause death by respiratory paralysis. It acts as a *mixed* emetic, both local and systemic, with great nausea and depression, and is now seldom used for that purpose. The secretions of the stomach and intestines are increased, and the bile is rendered more fluid and increased in amount.

For what is it used?

In *atonic dyspepsia*, *duodenal catarrh*, and *catarrh of the bile-ducts* it is serviceable in small doses as a stomachic tonic; in *acute bronchitis*, *later stages*, in combination as an expectorant; in chronic rhinitis with hypertrophy as an insufflation; in functional ammenorrhœa as emmenagogue; and chronic syphilitic and tubercular affections as an alterative.

Antimonii et Potassii Tartras (tartar emetic), dose gr. j–ij, the latter of which has proved fatal; it is too depressing to use except in an emergency, and probably acts as a mixed emetic.

DIAPHORETICS.

What are the uses of diaphoretics?

Diaphoretics are remedies employed to increase the secretory activity of the skin. They are employed therapeutically (1) as revulsive agents in the formative stages of certain diseases, acting by eliminating certain deleterious waste products and by relieving internal congestion; (2) to hasten absorption in general dropsy and serous accumulations, as pleurisy, pericarditis, ascites, etc.; (3) to eliminate *poisonous* materials from the blood, notably urea in uræmia; and (4) to aid in the subsidence of certain diseases which naturally end with a sweat.

Name some non-medicinal remedies employed as diaphoretics.

Certain measures for producing sweating are in vogue, as the hot-air or Turkish bath, the hot-vapor or Russian bath, and hot-water baths, either general or of portions of the body, as the foot-bath. Exercise, warm temperatures, and the ingestion of large amounts of hot fluids will *also favor* sweating.

How are medicinal diaphoretics classified?

Diaphoretics are generally classified as (1) *Stimulating, direct* or *simple* diaphoretics which enter the circulation and produce a direct stimulating effect upon the secreting tissues or their peripheral nerves: this class includes the diffusible stimulants and aromatic substances generally, and certain narcotics, notably opium and camphor; (2) *Nauseating diaphoretics*, which act by relaxing the orifices of the glands and allowing of a freer transudation of fluids through them—*e. g. ipecac* and *tartar emetic;* (3) *Refrigerant diaphoretics*, which produce sweating by reducing the force of the circulation and restoring the secretion of the skin, which like that of other organs is checked in the early stages of febrile conditions.

STIMULATING DIAPHORETICS.

PILOCARPUS (JABORANDI).

What are the source, properties, and constituents of pilocarpus?

Pilocarpus consists of the *leaflets* of *Pilocarpus pennatifolius*, a Brazilian shrub. These have a characteristic odor and a strong aromatic taste, and owe their activity to *pilocarpine*, an alkaloid of bitter astringent taste and soluble in all the ordinary menstrua. Another alkaloid, *jaborine*, has been isolated: it is a derivative of pilocarpine and antagonistic to it, in many respects resembling atropine.

What preparations are used?

Pilocarpus, powdered, dose gr. xx–℥j.
Extractum Pilocarpi Fluidum, dose ♏xv–℥j.
Pilocarpinæ Hydrochloras, dose gr. ⅛ to ¼.

What are its physiological effects?

Secretions.—The diaphoretic action of pilocarpus or its alkaloid, *pilocarpine*, upon which its activity depends, is due to a *direct stimulation* of the *secretory nerves at their periphery*. After the hypodermic administration of the drug sweating begins quickly, reaches its maximum in one-half to three-quarters of an hour, and lasts from two to four hours. The total amount is often very large, and there is found to be a large increase in the amount of urinary solids, especially *urea*, in its composition. The saliva is also often greatly increased, this increase being in inverse ratio to that of the perspiration. The explanation of this sialagogue effect is not clear, but it is due to stimulation either of the gland-cells or the nerve-endings. The secretions of the stomach and bronchi are also increased, in some cases that of the mammæ; and if the dose be too small to produce sweating, diuresis may occur. Children require proportionately very large doses to produce sweating. Other effects of jaborandi are slowing of the pulse with increased arterial tension, reduction of temperature when sweating begins, and great contraction of the pupil with increased intra-

ocular tension, the myosis being due to peripheral influence. It increases the power of uterine contractions when labor has begun.

For what is pilocarpus used?

This drug is serviceable in *pleurisy with effusion*, a very efficient means of promoting absorption; in *general œdema*, efficient, but depressing; in *uræmia* and *puerperal convulsions* this and hot-air baths are our main reliance; in *pulmonary œdema*, cases of which have been successfully treated by this drug; in *muscular rheumatism*, often greatly beneficial. In *alopecia* continued small doses may promote growth of hair. In *diphtheria* pilocarpus was at one time used with the idea of throwing off the membrane by the exudation produced. It is, however, too depressing.

How is it best administered?

The hypodermic administration of the hydrochlorate of pilocarpine, in doses of gr. $\frac{1}{8}$ to $\frac{1}{3}$ in watery solution, is preferable.

LIQUOR AMMONII ACETATIS.

How is it made? What are its constituent effects and uses?

Solution of ammonium acetate or spirit of Mindererus (spiritus Mindereri) is made by adding to dilute acetic acid enough ammonium carbonate to neutralize. When freshly made it contains about $7\frac{1}{2}$ per cent. of acetate of ammonium and free carbonic acid. It has been much, and for a long time, used as a *refrigerant diaphoretic* and *diuretic*, often in combinations with camphor, opium, or sweet spirit of nitre, but its action in these directions is feeble. It has slightly stimulating properties, and may be used in adynamic fevers, and in frequent large doses it is often of value in relieving the effects of acute alcoholism. Dose ℥ss–j every two hours in sweetened water, as it is disagreeable to the taste.

SPIRITUS ÆTHERIS NITROSI.

This preparation, commonly known as *sweet spirit of nitre*, and already noticed under *Ether*, is a 5 per cent. *solution of ethyl nitrite in alcohol*. It is a pale-yellow, volatile, inflammable liquid of pleasant, ethereal odor and sharp burning taste.

What are its effects and uses?

In therapeutic doses it produces no effect beyond *mild diaphoresis and diuresis*, with a slightly stimulant effect on the nervous system. In convulsive diseases in children it seems to be antispasmodic. Inhaled in large doses, it produces a train of symptoms similar to those of the *Nitrites*, q. v., and may even cause death. It is much used, chiefly in the *febrile affections of childhood*, as a *refrigerant diaphoretic and diuretic*, and is especially useful when nervous symptoms and a tendency to *convulsions* are present. Dose ♏x–℥j.

NAUSEANT DIAPHORETICS.

As above mentioned, practically only two drugs of this class are used for this purpose, *ipecac* and *antimony*.

Antimony, as tartar emetic in doses of gr. $\frac{1}{12}$ to $\frac{1}{6}$, may be used in the early or sthenic stages of acute inflammations.

Ipecac.—The various preparations of this drug, and pre-eminently Pulvis Doveri, Dover's powder, have for a long time been used in this way and with excellent results in the early stages of "*cold*," which may often be "broken up" by the timely use of this drug combined with a hot foot-bath and a large, hot, alcoholic draught; also in *muscular and acute rheumatism*, in which it allays the pain and produces sweating, thereby presumably assisting in the elimination of deleterious matters; for this purpose gr. v should be given every three or four hours. In *suppression of menstruation* with very severe pain it is often particularly efficient.

REFRIGERANT DIAPHORETICS.

Name some of the more important ones.

All cardiac depressants, as aconite, veratrum viride, and the vegetable acids, belong to this class. The citrate of potash is constantly employed in this way, either in the *effervescing citrate* or the *neutral mixture* (mistura potassii citratis), and is preferable to the more powerful depressants.

Alcohol.—Alcohol in full dosage, especially when taken in hot drinks, causes dilatation of the cutaneous vessels and a more or less profuse perspiration. It is a domestic remedy of value, and is much used, combined with Dover's powder or a hot foot-bath, in "*cold*," *rheumatism*, and *dysmenorrhœa*.

EXPECTORANTS.

What are they? and how are they classified?

Expectorants are remedies used in inflamed conditions of the mucous membranes to modify the secretion in some way. There are two classes of expectorants, which are to be employed judiciously according to the stage of inflammation. In the so-called "dry" or early stages of bronchial inflammations, the sedative expectorants, by nauseating and by lowering the arterial tension, give rise to a relaxation of the tissues which allows of secretion, just as is the case with diaphoretics. In the later subacute or chronic conditions an entirely different class, the *stimulating expectorants*, are indicated. In pneumonia expectorants are contraindicated, and in all inflammations of the broncho-pulmonary mucous membrane narcotics, as opium, hyoscyamus, and other depressing drugs, some of which no doubt decidedly modify secretions, are to be used with caution, especially in children and the aged.

NAUSEATING OR SEDATIVE EXPECTORANTS.

Two of the three sedative expectorants in common use, *ipecac* and *antimony*, are also diaphoretic. Lobelia is also somewhat used for this purpose. All of them have been already treated at length, and a few words only are necessary as to their expectorant properties.

LOBELIA.

What are its uses as an expectorant?

Lobelia is used only when there is a tendency to *bronchial* and *laryngeal spasm*, as in *asthma*, either iodiopathic or secondary to some other condition, in *whooping cough*, and in *laryngismus stridulus*. It is a somewhat dangerous remedy, and is now seldom used, especially in children.

ANTIMONY.

What are its uses and contraindications?

Generally used in the form of *tartar emetic*. It also is too depressing for ordinary use, but is sometimes of great value in cutting short an attack of acute bronchitis, for which purpose it has to be carried to the point of producing decided nausea or even vomiting. Its employment in children is contraindicated except in the most minute dosage. The *wine of antimony* may also be employed.

IPECAC.

What can you say of its value as an expectorant?

This drug is *the* depressing expectorant most commonly in use. Syrup of ipecac is a standard remedy in the early stages of acute bronchitis, given in frequently repeated, moderate doses (ɱxx–xxx), although any other preparation may be used. It is perfectly safe, and is the best one of these drugs to be used in children.

GRINDELIA.

What is grindelia? Upon what does its activity depend?

Grindelia consists of the *leaves*, *stems*, and *flowers* of *Grindelia robusta*, a plant of the Western States. It contains a *volatile oil*, *resin*, and an asserted alkaloid. The *fluid extract* is officinal in doses of ʒss–j.

What are its effects?

The taste of grindelia is pungent and persistent, and it gives in the stomach a sensation of warmth, at first stimulating the appetite and digestion, but if continued deranging them. It depresses the heart and lowers arterial tension (?), but after therapeutic doses these effects are very slight. Impairment of sensation and mobility and diminution of reflexes are produced by large doses. Toxic effects are rare. It is

eliminated by the kidneys and pulmonary mucous membrane, and partakes of the character of a mixed sedative and stimulant expectorant.

For what is it used?

Grindelia is used principally in respiratory conditions where *bronchial spasm* is a prominent feature, as in *asthma*, in which its utility is very great, and in *whooping cough*. It may also be used in subacute and chronic bronchitis, and is said to be a successful stimulant of the urinary tract in chronic pyelitis, chronic cystitis, etc.

Pulsatilla.—This drug, which has already been mentioned in another connection, is also a valuable sedative in the very early stages of acute bronchial inflammation. It should never be used when gastro-intestinal irritation is present.

STIMULATING EXPECTORANTS.

Some drugs which are employed as expectorants of this group have been already mentioned among the blennorrhetic diuretics, notably oil of turpentine.

SENEGA.

What of senega and its active principles?

Senega is the *root* of *Polygala Senega*, or senega snake-root, a small plant of this country. The cortical portion of the root alone is active, the woody part being inert. The dried root has a faint, peculiar odor, and a taste at first sweet and mucilaginous, but later acrid and irritating. It yields its virtues to both water and alcohol, and owes its activity principally to *polygalic acid* or *senegin*.

What are its officinal preparations?

Abstractum Senegæ, dose gr. j–iv.
Extractum Senegæ Fluidum, dose ♏ij–v.
Syrupus Senegæ (about 1 part fluid extract in 6), dose ʒj–ij.
It is also present in the *Compound Syrup of Squill* (q. v.).

What are its effects and uses?

Locally, senega is an irritant, and in large doses may prove emetocathartic. In small doses it freely stimulates secretions generally, with a special action on the pulmonary mucous membrane. It is chiefly given as a stimulant expectorant in subacute and chronic bronchitis. In combination with the nauseant expectorants, as in syrup. scillæ comp., which contains tartar emetic, it is sometimes prescribed in the acute stages. It has been used as an emmenagogue and diuretic.

AMMONII CHLORIDUM (AMMONIUM CHLORIDE OR MURIATE).

What are its properties?

Chloride of ammonium is formed by neutralizing *gas liquor* (water which

has been used to wash burning gas, and contains the carbonate, hydrosulphate, and sulphate of ammonium) with hydrochloric acid. It occurs in white, translucent, tough masses, odorless, but having a sharp saline taste. It is partially deliquescent, somewhat soluble in alcohol, and freely soluble in water.

What are its effects and uses?

Locally, this salt is an irritant to the skin and mucous membranes, and in large doses purges and occasionally produces emesis. After absorption it is an alterative, diminishing the plasticity of the blood and increasing the urinary solids, with the exception of uric acid, which is somewhat diminished. It differs from other ammonium preparations in producing, in medicinal doses at least, very little circulatory effects, and in large doses it appears to be depressant. It exerts a selective action on mucous membranes, producing nutritive changes and epithelial exfoliation. It is eliminated chiefly by the urine, but in small proportion by all the secretions. Muriate of ammonium is chiefly used in the *later stages of acute* and in *chronic bronchitis*. It it also used in *muscular rheumatism*, *neuralgias* (especially in *migraine* and *ovarian neuralgias*), *hepatic torpor*, and good effects have been claimed for it in hepatic abscess. Dose gr. v–x three times daily, or for children gr. j–ij. For neuralgias large doses, gr. xx–xxx, repeated in an hour, are given.

ALLIUM (GARLIC).

What is allium?

Allium sativum is a small perennial plant indigenous in Southern Europe and cultivated in this country. The *bulb* is the portion used. Its physical properties are too well known to require comment. It yields its virtues to water, vinegar, and alcohol, and owes its efficiency to an *essential oil*, which is very volatile and irritating. Garlic locally is irritant and rubefacient, and is used for these purposes externally. It is also claimed to be a cardiac and nervous stimulant. It is especially valuable in the *acute bronchitis* of children, and has also been employed as an expectorant in *subacute and chronic bronchitis*, and as a *stomachic* and *diuretic* in other conditions. Its preparations are—

Allium, dose ʒss–ij.

Syrupus Allii, dose ʒj–ij.

BALSAMUM PERUVIANUM.

What are its origin and constituents?

Balsam of Peru is obtained by incisions into the *bark* of *Myroxylon Pereiræ*, a tree of Central America. It occurs as a thick, reddish-brown fluid of a pleasant odor and warm acrid taste. It is soluble in alcohol. It contains *resin*, an *aromatic oil* called *cinnamein*, and *cinnamic* and *benzoic acids* as its essential elements, and several other constituents. In

doses of gtt. x–xxx it is used as a *stimulant diuretic* in *catarrhs of the respiratory tract*, and to some extent in those of the genito-urinary tract, but is not nearly so much used *internally* as is the following drug. In surgery it has a distinct place as a stimulant application to sluggish granulations, although recently antiseptic properties have been denied it. It is given in emulsion.

BALSAMUM TOLUTANUM.

What is balsam of Tolu?

Balsam of Tolu is a *balsam* obtained from incisions into the *bark* of *Myroxylon toluifera*, also a Central American tree. It is at first a thick, viscid fluid, like balsam of Peru, but hardens with time into a resinous solid. It has a fragrant odor, a warm sweetish taste, and is quite soluble in alcohol and essential oils. Its composition, effects, and uses are practically the same as those of balsam of Peru, but its more agreeable flavor renders it preferable to the latter for internal use. Its *tincture* and *syrup* are much used as vehicles. Of the former the dose is ʒj–ij; of the latter, ʒss–j.

PIX LIQUIDA (TAR).

Give the source, properties, and derivatives of tar.

This familiar substance is derived by destructive distillation of various species of pine, chiefly *Pinus palustris*, the yellow pine of the South. Its physical peculiarities are well known. It is soluble in alcohol, ether, volatile oils, and fixed oils, and contains *resin*, *oil of turpentine*, etc. When distilled it yields *pyroligneous acid* and *oil of tar* (from which creasote is obtained), the residuum being *pitch*. The preparations are—

Oleum Picis Liquidæ, external use.

Syrupus Picis Liquidæ, ʒj–ij.

Unguentum Picis Liquidæ, tar and suet, *āā.* partes æquales.

What are its effects and uses?

Tar resembles the turpentines in action. Locally it is a decided stimulant, and in ointments and soaps is used in eczema, psoriasis, scabies, and other skin diseases. Its internal use may lead to some gastric irritation, and in large doses to irritation of the kidneys and some increase of the urine. As the *syrup* or as *tar-water* internally or inhaled as a vapor it is employed as an expectorant in laryngitis and bronchitis.

TEREBENE.

What is this drug?

Terebene is a colorless volatile oil, of a not unpleasant terebinthinate odor, formed by the action of strong sulphuric or phosphoric acid upon oil of turpentine. It is a valuable stimulant expectorant, and is employed with good effect in *subacute* and *chronic bronchitis*, probably

acting on the broncho-pulmonary and genito-urinary mucous membranes much like oil of turpentine. It should be administered in emulsion or capsule in doses of ℥v–xv.

TERPIN HYDRATE.

What are its important properties?

Terpin hydrate, also a derivative of turpentine, is a crystalline solid of very little taste and odor. Its effects, uses, and method of administration are the same as those of terebene, but it is probably inferior to that drug.

EMMENAGOGUES.

Emmenagogues are remedies employed to promote the menstrual discharge. Absence of this function, or *amenorrhœa*, may be dependent on or associated with a variety of constitutional conditions, as anæmia, plethora, constipation, wasting disease, etc., relief of which may bring on the menses. Drugs employed for this purpose are called indirect emmenagogues, and may be still further subdivided into *tonic* and *purgative emmenagogues*. *Direct* or *stimulating emmenagogues* act, not, as in the case of blennorrhetics, specifically and appearing in the secretion, but by causing congestion of the pelvic organs.

What are some important indirect tonic emmenagogues?

Ferrum.—Iron with its compounds is by far the most important member of this group. The association of amenorrhœa with anæmia is very common, and is the indication for the use of this drug. It is given in full doses, and it is often well to combine it with purgatives or stimulating emmenagogues.

Manganum.—Manganese, either as the *binoxide* or the *permanganate of potassium*, is employed in the same way as iron, and probably produces similar effects, although some claims have been made that it directly stimulates uterine contraction—viz. that it is a direct emmenagogue. Dose of either preparation, gr. j–ij. The binoxide is preferable, as it causes less gastric disturbance.

Myrrha.—Myrrh has been employed for emmenagogue purposes, but its efficacy is doubtful. It is generally used in combination with iron or aloes.

Name some purgative emmenagogues.

Aloes.—This drug, as is shown under *Cathartics*, exerts a specific action on the peristalsis of the large intestine, and part of this irritation seems to be transmitted to the neighboring uterus. It is a useful emmenagogue in cases associated with constipation and atonic conditions generally. It is to be given in sufficient doses daily to produce a moderately laxative effect, and it is well to administer a large dose at the proper time for the menstrual period. When plethoric amenorrhœa

exists, which is probably but rarely, salines and depleting drugs are indicated.

DIRECT OR STIMULATING EMMENAGOGUES.

SABINA (SAVINE).

What is sabina? What is oleum sabinæ?

Sabina is the dried *tops* of *Juniperus Sabina*, a small evergreen shrub of Southern Europe. Its activity depends upon an officinal volatile oil (oleum sabinæ), which has a strong, peculiar, heavy odor and a burning, nauseous taste.

What are its effects and uses?

Locally, savine is an irritant to the skin and mucous membranes. In medicinal doses it produces a feeling of warmth in the stomach, with perhaps nausea, and slightly stimulates the circulation and secretions. In doses large enough to be toxic the symptoms produced are those of acro-narcotic poisoning—viz. nausea, vomiting, purging, abdominal pain, suppression of urine, or hæmaturia, with such nervous symptoms as unconsciousness and at times convulsions. Collapse and death ensue. The lesions produced are those of gastro-intestinal inflammation. It has a very decided effect on the uterus, *instituting* or *increasing its contractions*, and in pregnancy may cause abortion. It is useful in *amenorrhœa* and *menorrhagia* when dependent upon a relaxed condition of the organs. The preparations are—

Extractum Sabinæ Fluidum, dose ♏iij–viij.
Oleum Sabinæ, dose ♏j–v.
Ceratum Sabinæ, seldom used.

RUTA (RUE; not officinal).

What are its constituents, effects, and uses?

Rue is the *leaves* of *Ruta graveolens*, or garden rue, a shrub of Europe. Its activity depends upon a *volatile oil*, oleum rutæ, also non-officinal, and it also contains a neutral principle, *rutin*. It is a decided irritant, its effects and uses resembling those of savine. It is also used somewhat as a *carminative*, an effect which it owes to its aromatic volatile oil. Dose of the *oil*, gtt. ij–v.

PETROSELINUM (PARSLEY).

What is apiol?

Petroselinum sativum, or *garden parsley*, contains a volatile oil known as *apiol* or *parsley camphor*. This is a colorless or yellow oil, with a strong characteristic odor, non-saponifiable, soluble in alcohol, ether, and chloroform, but not in water. It has been successfully used in functional

amenorrhœa and *neuralgic dysmenorrhœa*. Dose gtt. iij–vj, *b. i. d.*, in capsule for three or four days previous to the expected menstrual period.

TANACETUM (TANSY).

What is it?

Tanacetum vulgare, the common tansy of the gardens, is sometimes employed in the form of a decoction ("tansy tea") or of its volatile oil as a stimulant emmenagogue, or more often for criminal purposes. It is a very unsafe remedy, sufficient doses causing symptoms of gastro-intestinal irritation and epileptiform convulsions.

POLYGONUM HYDROPIPEROIDES.

What can you say of Polygonum hydropiperoides?

This drug, known also as *water-pepper* or *smartweed*, is an indigenous plant growing in moist places, and containing *polygonic acid* and other principles. It is a diaphoretic, diuretic, and expectorant, and in excessive doses a gastro-intestinal irritant. It is a stimulant emmenagogue and aphrodisiac, and has been employed in *functional amenorrhœa* and *functional impotence*, as well as in diarrhœa, dysentery, and for its diuretic properties.

Cantharides and other *stimulating diuretics* are also employed as emmenagogues. Combinations of iron, cantharides, aloes, and guaiac are favorite prescriptions for this purpose.

OXYTOCICS.

Define this term.

Oxytocics are remedies used during or immediately after labor to energize uterine contractions. Practically, the only drug used for this purpose is ergot, although similar powers are claimed for quinine and certain other remedies.

ERGOTA (ERGOT).

What is ergot? What can you say of its composition?

Ergot is the *sclerotium* (intermediate stage of growth) of a fungus called *Claviceps purpurea*, replacing the grain of rye (*Secale cereale*), which is then known as "spurred rye" (*Secale cornutum*). The *composition* of ergot is very complex, and the identity of its active principle has not been made out. It contains *ecbolin*, *ergotin*, *ergotinin*, *ergotic*, *phosphoric*, and *sclerotic acids*, and a variety of other constituents. Sclerotic acid is at present most likely to prove its active principle. Upon whatever it depends, ergot yields its activity to both water and alcohol, and *ergotin*, which is in reality nothing more than a watery *extract, represents* the drug.

What are the preparations of ergot?

These should be *freshly made*, as both the powder and its derivatives deteriorate decidedly by exposure:

Ergota, powdered, dose ʒss–ij.

Extractum Ergotæ, dose gr. v–ʒss.

Extractum Ergotæ Fluidum (most used), dose ʒss–ʒ̄ss.

Vinum Ergotæ, 16 per cent., dose ʒij–ʒ̄ij.

Ergotin, which is not officinal, is really an aqueous extract, and may be used when a solid preparation is desired. Bonjean's is best. Dose gr. iij–x.

What are its physiological effects?

To the therapeutist the chief interest lies in its effects upon the circulation and the uterus. Ergot induces contraction of unstriped muscle wherever found, with a specific action on that of the uterus and the intestine. In the *impregnated* uterus ergot has the power of *initiating* contractions, and of greatly increasing their force when already begun; while in the unimpregnated it also produces contractions, as is seen from the pain produced and its effect on hemorrhagic and other morbid processes of the uterus.

Circulation.—Upon this function its effects are quite noticeable: it slows the pulse, probably by a direct action on the heart, and causes a contraction of the arterioles and a stimulation of the vaso-motor centre, which result in an immense increase of arterial pressure. In some cases, at least, the intestinal peristalsis is very greatly stimulated.

What are the varieties of ergotism?

Two varieties of poisoning may occur—acute and chronic, to the latter of which the term *ergotism* is applied. The symptoms of a single overdose are those of acro-narcotic poisoning. The chronic form of poisoning, or *ergotism*, results generally from eating ergotized grain, and has never occurred to any extent in this country, but epidemics of it occur from time to time in Europe. Two forms are recognized—*convulsive* and *gangrenous* ergotism. In either form the initial symptoms are generally identical—itching, formication, and other subjective sensations of the feet. Then in the *convulsive* variety symptoms of gastro-enteric irritation appear, followed in a short time by violent and painful *tonic contractions* of the flexor muscles, at first with intermissions, but later becoming more or less tetanic, and finally resulting in death from exhaustion. In the *gangrenous* form are added heavy feelings in the limbs, subjective or real coldness of the surface, *anæsthesia*, and finally an atrophic gangrene of the extremities or of the nose, ears, etc.

In the acute poisoning seldom anything worse than abortion is produced. When this is threatened, quiet, a recumbent position, and nervous sedatives are indicated. In the chronic form many die.

What are the uses of ergot?

In *obstetrical practice* ergot is employed in the following conditions:

Its *most common* use is in labor *after the delivery of the placenta*, to ensure full uterine contraction, the expulsion of clots, and to prevent post-partum hæmorrhage. By some it is given as early as the second stage, but there is a possibility of its rendering the delivery of the placenta difficult. In *uterine inertia* small doses may be administered, it having first been ascertained that no mechanical impediment to a natural and speedy delivery exists either in the mother or the child. A dose of ℥v–xv of the fluid extract will intensify the uterine contractions, but not render them tetanic. The *dangers* of administering ergot before the delivery of the child are that it may set up a *tetanic contraction* of the uterus, which may result in its rupture or suffocation of the child by interfering with the placental circulation.

Ergot is employed *to arrest bleeding* in a variety of conditions where no local measures are available, as in *menorrhagia* and *metrorrhagia*, whether from fibroids, endometritis, or other causes; in the *hemorrhagic diathesis* combinations with digitalis and gallic acid will often prove valuable; also in purpura, epistaxis, hæmoptysis, etc., but its efficiency is not great. In cerebral congestion, if hemorrhage can be positively excluded—which in most cases is impossible—and in *congestion of the spinal cord*, it may give satisfaction, and should be administered in large doses (ʒss–j of the fluid extract, *t. i. d.*). Some deny it any efficacy in both these conditions, and from the uncertainty of diagnosis in *cerebral* conditions its use in the former is probably unsafe. Ergot has also been used with asserted success in neuralgias, epilepsy, whooping cough, leucæmia, varicose veins, aneurism, and numerous other conditions.

GOSSYPII RADICIS CORTEX.

Of what importance is it?

This remedy, which is said to be used as an abortifacient by the negro women of the South, possess oxytocic properties which are probably feeble, and it has not come much into favor for that purpose. It has been used to some extent in amenorrhœa and dysmenorrhœa. The dose of the fluid extract is ʒss–ij.

USTILAGO (CORN ERGOT).

What are its source and properties?

Ustilago maydis (corn smut or corn ergot) is a fungoid growth on *Zea mays*, or Indian corn. It occurs as irregular masses growing on all parts of the plant, but more frequently on the ears, composed of black gelatinous matter enclosing dark nodular spores. Its odor is disagreeable and its taste unpleasant. It probably contains *sclerotic acid*, and its effects are supposed to be those of ergot, for which it has been substituted.

CIMICIFUGA.

What are its source and component parts?

Cimicifuga is the *rhizome* and *rootlets* of *C. racemosa* (black snake-root or black cohosh), an indigenous perennial plant. The active principle has not been isolated, but it contains a *volatile oil*, *resins*, a *bitter principle*, and *tannic* and *gallic acids*.

What preparations are officinal?

Cimicifuga, dose gr. xx–3j.
Tinctura Cimicifugæ, dose ʒss–ij.
Extractum Cimicifugæ Fluidum, dose ʒss–j.

What are its physiological effects?

The effects of this drug are not entirely clear. It resembles digitalis in its effect upon the circulation, and ergot upon unstriped muscle, but it is weaker in both respects. It increases the secretions of the skin, mucous membrane, and kidneys, and is supposed to have aphrodisiac and emmenagogue properties.

What are its uses?

This drug has been variously classed as an antispasmodic, expectorant, antirheumatic, and emmenagogue. In chorea its value is unquestionable. As an expectorant it has been employed in *chronic bronchitis*. Furthermore, it has been employed as a diuretic in dropsies, a diaphoretic in acute rheumatism, and a cardiac tonic in fatty and dilated heart. It is useful in subinvolution of the uterus and in various nervous conditions reflexly dependent on menstrual difficulties, which it tends to correct.

IRRITANTS.

What are irritants? and how are they classified?

Irritants are remedies employed to produce hyperæmia or inflammation of the parts to which they are applied. According to the intensity of their action they are divided into *rubefacients*, which simply produce redness of the skin; *vesicants* or *epispastics*, which cause an exudation of serum beneath the cuticle; *suppurants*, which cause pustulation; and *escharotics*, which cause actual tissue-destruction.

What is the rationale of their action?

The *modus operandi* of counter-irritants is not altogether clear. Clinical experience for ages, however, has shown their value, which probably depends upon some reflex effect upon the vaso-motor supply or the trophic nerves, by which the vascular supply of internal organs is modified and inflammatory processes are affected.

What are the general indications for counter-irritants?

These measures are used (1) for the relief of pain, either by an in-

mediate action upon the painful nerve or by affecting its blood-supply reflexly; (2) to modify sthenic inflammatory processes; (3) to promote absorption of serous accumulations, as in pleurisy, pericarditis, and chronic joint diseases; and (4) to produce a general tonic effect upon the circulatory and nervous systems, as by mild counter-irritation by the actual cautery over considerable areas.

When are they contraindicated?

Counter-irritants are not to be used in acute conditions characterized by high arterial and febrile excitement, lest they add to these by the general febrile disturbance they themselves cause: nor, again, in cases where decided asthenia exists, lest they produce a destruction of tissue, which, owing to the weakened condition, will not readily be repaired.

RUBEFACIENTS.

What conditions indicate these?

This class of irritants is employed when a local analgesic effect is required or a local stimulation of the capillary system, and also as mild, general, but not permanent, stimulants in depressed conditions of the system. It is as pain-allaying measures that they are particularly valuable. When too long continued they may prove destructive to tissue—viz. epispastic or escharotic—and this is to be guarded against in asthenic conditions.

SINAPIS ALBA (WHITE MUSTARD); SINAPIS NIGRA (BLACK MUSTARD).

What is mustard?

Mustard is the *seeds* of two varieties of Sinapis, *S. alba* and *S. nigra*, both of which are natives of Europe, but are cultivated elsewhere. The seeds of the former are larger, of a yellowish color externally, and have a less pungent taste than those of the latter.

How is the volatile oil formed?

The two varieties differ somewhat in composition. By the action of *myrosin*, an albuminous ferment, upon *sinnigrin*, a principle peculiar to *black* mustard, in the presence of water a very pungent *volatile oil* is formed. It does not pre-exist in the seeds. The *white* seeds yield no volatile oil, but by the action of the *same ferment* upon *sinalbin*, an *acrid fixed principle* is produced having somewhat similar properties. The activity of the ferment is checked by heat and acids, and somewhat by alcohol, so that cold, or at most tepid, water is the proper menstruum for both varieties. The *volatile oil* and the *acrid fixed principle*, then, are the active constituents of the two varieties of seeds.

What are the preparations of sinapis?

Sinapis Alba is only used externally; no officinal preparations.

Sinapis Nigra, powdered, as emetic internally; dose ʒj–ij.

Charta Sinapis.

Oleum Sinapis Volatile, which is used only in Linimentum Sinapis Compositum.

What are its effects and uses?

Internally, in small does, mustard is a stomachic and cardiac stimulant: in large doses it produces vomiting, while very large amounts cause gastro-intestinal inflammation. *Locally*, mustard is an irritant, the degree of its activity depending on the dilution in which it is used and the duration of its employment. These effects vary from those of a very mild rubefacient to vesication, and even the production of sloughing.

Its internal use is for the most part limited to the production of emesis. (See *Emetics.*) Locally, it is very much employed as a *sinapism* for mild cutaneous irritation in a variety of painful and inflammatory conditions too numerous to mention. It is an active irritant, but very easily controlled by judicious admixture with flour, Indian meal, or flaxseed.

CAPSICUM (CAYENNE PEPPER).

What is capsicum?

This drug is the *fruit* of *Capsicum fastigiatum*, a tropical and widely-cultivated plant. It contains *fixed and volatile oils* and a principle called *capsaicin.*

What are its effects and uses?

Locally, capsicum is an excellent rubefacient, and if its use is prolonged it may vesicate. It is less used than mustard, because more diffusible and more apt to produce irritation of distant parts.

Many other spices, as cloves, cinnamon, black pepper, ginger, etc., are used as counter-irritants, either alone or in some combination generally known as "spice plasters."

PIX BURGUNDICA (BURGUNDY PITCH).

What are its source and properties?

Burgundy pitch is the resinous *exudation* from *Abies excelsa*, or Norway spruce, occurring in the shops as a yellowish, brittle substance, of a taste and odor resembling turpentine. At the surface temperature of the body, however, it is plastic and adhesive.

What preparations does it enter into?

Emplastrum Picis Burgundicæ, 90 per cent., in yellow wax.

Emplastrum Picis Burgundicæ cum Cantharide, or "warming plaster," which sometimes vesicates. It is also used as a basis for several other plasters.

What are its effects and uses?

Burgundy pitch is a gentle irritant, producing only mild inflammation and seldom vesicating, although at times a vesicular eruption may follow its use. In its various *emplastra* it is employed in *chronic joint* and *pulmonary conditions* and in *muscular* rheumatism, especially lumbago.

PIX CANADENSIS (CANADA PITCH).

Describe its source, effects, and uses.

This is the prepared resinous *exudation* of *Abies Canadensis*, or hemlock spruce. It resembles the above in appearance, but is somewhat darker in color and possesses very little odor or taste. Its effects, which are due, as in Burgundy pitch, to a *contained resin* and *volatile oil*, and its uses, correspond to those of that drug, but it is softer at the body temperature and a less convenient application. Its only preparation is—

Emplastrum Picis Canadensis, which is 9 parts pitch, with 1 part of yellow wax to give it consistency.

Oleum Terebinthinæ.—The use of *turpentine stupes* has already been spoken of. In stronger solutions oil of turpentine is a powerful and painful irritant. The preparations are—

Oleum Terebinthinæ, dose ℿx–℥ss.

Linimentum Terebinthinæ, "Kentish ointment."

VESICANTS.

What are the general indications for vesicants?

The theory of their action has already been discussed. Their chief uses are (1) as *derivatives* or *revellents* for the cure of *acute* or *chronic inflammation*; (2) as *analgesics*; (3) to *promote absorption* of collections of fluid; (4) in nervous conditions to break up a train of morbid associations; and (5) for the cure of certain diseases of the skin. The drug most used for vesication is

CANTHARIS (CANTHARIDES).

What is cantharis?

This drug, commonly known as Spanish fly, is a dried insect, *Cantharis vesicatoria* or *Lytta vesicatoria*, found in Southern Europe. The odor of the insects is described as resembling that of mice, and their taste as acrid, burning, and urinous. They contain as their active principle *cantharidin*, which is odorless, tasteless, and insoluble in water, but rendered soluble in this menstruum by other constituents of the drug, so that *cantharidin* yields its virtues to water and also to alcohol.

What are the preparations of cantharis?

Pulvis Cantharidis (seldom used), dose gr. j–ij.

Tinctura Cantharidis, 5 per cent., dose gtt. j–v.

Ceratum Cantharidis, "blistering plaster," 30 per cent.
Ceratum Extracti Cantharidis.
Charta Cantharidis, "blistering paper."
Linimentum Cantharidis, 1 part canth., 7 of ol. terebinth.
Collodium cum Cantharide, about 50 per cent. cantharides.
Emplastrum Picis Burgundicæ cum Cantharide (warming plaster) contains 8 parts of cerate of cantharides and 92 parts of Burgundy pitch.

With the exception of the *tincture* these preparations are all used for blistering. This takes place in from six to eight hours. "Cantharidal collodion" is easily applied, and is valuable in refractory patients because not easily removed.

What physiological effects does it produce?

Locally to the skin, in which way it finds its chief use, cantharis is an active irritant, causing redness, burning pain, vesication, and, if too long maintained, even sloughing of the deeper tissues. Its effects upon the mucous membranes are similar, and when ingested in large doses it causes violent gastro-enteritis. The drug is eliminated by the kidneys, and there again proves irritant, in *small doses* increasing the amount of urine, and perhaps causing some pain on urination, while *large doses* may be followed by hæmaturia, strangury, priapism, intense erotic desire, and excruciating pain. The aphrodisiac effect is not constant. Cantharis is freely absorbed from its own blister, and when so used may cause these symptoms, and should be employed with care when any kidney lesion exists.

What are the symptoms, lesions, and treatment of toxic doses?

The *effects* of toxic doses are briefly stated: *severe gastro-enteric and genito-urinary irritation.* The *treatment* consists in evacuation of the stomach, if this has not already taken place, and the administration of opiates and demulcents, avoiding, however, all oily substances, in which cantharidin is easily soluble: 20 grains are said to have proved fatal. The *lesions* after death are those of intense inflammation of the entire alimentary tract and an acute desquamative nephritis.

What are its therapeutic effects?

Its occasional use as a diuretic and emmenagogue has already been noted. Locally, it is a favorite, and, in fact, the most efficient, method of producing vesication, and is used to fulfil any of the indications for blistering which may arise, bearing in mind the possibility of its causing genito-urinary irritation in patients with renal disorder.

Cantharis vittata, or potato fly, and other varieties of Cantharis are used as substitutes for *Cantharis vesicatoria*. They contain cantharidin and possess similar properties to the officinal drug.

Aqua Ammoniæ Fortior.—This drug, applied to the skin on flannel or under a watch-glass to prevent evaporation, will produce vesication very quickly (five to ten minutes), but it is extremely painful, and should seldom be used except in an emergency.

ESCHAROTICS.

What are the general indications for their use?

Escharotics, *caustics*, or *cauterants* are drugs employed to destroy the structure or vitality of tissues. They are employed (1) to effect the removal of morbid growths, as warts, condylomata, lupus, cancer, etc.; (2) to destroy as far as possible the virus in wounds made by rabid or venomous animals; (3) to cure *violent* inflammations, as in gonorrhœa, ophthalmia, malignant pustule, etc.; and (4) to stimulate indolent ulcers and sinuses. They vary greatly in the character and intensity of their action, from the production of a mere film, as by lunar caustic, to the widely destructive action of some members of the group.

ARGENTI NITRAS FUSUS.

What is the peculiarity of its action?

This preparation, which has already been described, *does not liquefy*, and so affects the tissues to which it is applied *only superficially* and forms a *protecting pellicle* over them. It is very frequently used to stimulate granulations and destroy them when exuberant, and in a great variety of inflammatory conditions.

POTASSA.

What is caustic potash?

Caustic potash is prepared by evaporating liquor potassæ. When fused it is cast in moulds, forming sticks of a grayish or brown color, very deliquescent, and having a caustic, saltish taste. These contain certain impurities which are insoluble in alcohol, while potassa itself is freely soluble in this menstruum and in water. In this way a pure white salt is obtained, known as *alcoholic potassa*.

What are its effects and uses?

Potassa is a very powerful caustic. When applied to the skin it melts, abstracts the water from the tissues, and forms a dirty, grayish slough which is very permeable, so that its action extends to a considerable depth. It causes great pain. It may be used to meet any of the indications for the more powerful cauterants, as in the destruction of *chancres*, *poisonous bites*, *malignant pustules*, *lupus*, *rodent ulcers*, and *epithelioma*.

Potassa cum calce, or *potassa with lime*, contains equal parts of these ingredients. It occurs in sticks or in an alcoholic paste called "Vienna paste." It is milder, less deliquescent, and more easily limited than potassa, and is more often used.

CAUSTIC SODA.

How is it similar to, and how different from potassa?

Caustic soda is prepared in an analogous way to potassa. Its physical properties are also for the most part similar, but it is less translucent, and, although deliquescent, it does not remain permanently liquid, but after a time effloresces. "London paste" is equal parts of caustic soda and lime. The uses of caustic soda are the same as for *Potassa*.

ACIDUM ARSENIOSUM.

What can you say of its cauterant effects?

Arsenic has already been described at length. It remains only to consider its action and uses as a caustic. Applied to the tissues, it is a very powerful but slow and extremely painful escharotic, producing intense inflammation of surrounding tissues. It affects the tissues as an irritant, destroying their vitality, rather than in a chemical manner. Absorption of a serious nature may take place from a raw surface. However, the more freely it is applied the less the danger of absorption seems to be, and when used over areas of any size it must be used freely. Various pastes and ointments have been employed, varying only in the substances used to render its effects milder and less painful. It is occasionally used in lupus, epithelioma, and other dangerous conditions.

ZINCI CHLORIDUM.

What are the advantages of chloride of zinc as a caustic?

The chloride of zinc is only slightly less powerful than potassa, and seems to possess to a degree the power of *disinfecting its own slough*, so that the subjacent tissues are left in a healthy granulating condition after the slough separates. Its use is free from danger as regards absorption. The indications for its use are those mentioned under *Potassa*, and it is also an excellent stimulant to sluggish ulcers and sinuses.

In what form is it used?

It may be employed in *an alcoholic* or *a watery solution*, in both of which it is freely soluble; but it is more generally used as Canquoin's paste, which is made by mixing it with equal parts of wheaten flour with a little water: varying proportions, however, of the chloride are used according to the condition in hand.

BROMUM.

What are the properties of bromine?

The element bromine is a dark-red liquid, volatilizing in exceedingly pungent fumes, which are very irritating to the broncho-pulmonary mu-

cous membrane. It is caustic to the taste and of a disagreeable odor, and is freely soluble in ether, less so in alcohol and water.

What are its effects and uses?

It affects the tissues chemically, decomposing hydrogen compounds and forming hydrobromic acid. Owing to its liquid form and volatility it is a rapid and thorough caustic, and possesses deodorant and disinfectant properties. It is seldom used as a caustic, the occasion for its use being limited chiefly to hospital gangrene and carcinoma uteri. In weak solutions it may be inhaled in small amounts in offensive catarrhal conditions, as ozæna.

ACIDUM CHROMICUM.

What are its source and properties?

Chromic acid (chromic anhydride) is made by the addition of sulphuric acid to a solution of potassium bichromate. It occurs in deep-red, needle-form crystals, easily *deliquescing* to a deep-red liquid, and very soluble in water, forming an orange-yellow solution.

What are its effects and uses?

Applied to living tissues, it rapidly oxidizes and decomposes them, its cauterant action being very active, but less painful than other members of this group. Internally, it is a violent corrosive poison, and death has taken place from absorption following its external use. It finds its chief use in the hands of the dermatologist for the destruction of syphilitic condylomata and other dermal growths.

What dangerous combinations should be avoided?

When mixed with easily oxidizable substances, as strong alcohol, glycerin, etc., it is liable to cause combustion, or even an explosion, so great is its oxidizing power.

HYDRARGYRUM.

What preparations of mercury are caustic?

Hydrargyri chloridum corrosivum (corrosive sublimate) in saturated solutions may be used as a mild caustic in chancroidal and other conditions. It is less powerful in its action than liquor hydrargyri nitratis. This preparation is made by dissolving Hg or its red oxide in an excess of nitric acid. It contains free nitric acid, and is a clear, acid, highly corrosive liquid, and is said to possess peculiar efficacy in syphilitic conditions.

ACIDUM NITRICUM.

What are its uses?

Nitric acid is a powerful caustic, useful for the cauterization of small areas. It is applied with a glass rod or a splinter of wood, as it attacks

and destroys most metallic substances. It is very penetrating, a drop or two being sufficient. When enough tissue has been destroyed it is limited in its action by neutralizing it with an alkali. Like that of other mineral acids, unless this be done its action is apt to extend beyond the point of application.

What other acids are employed for this purpose?

Sulphuric, hydrochloric, and the stronger and glacial acetic acids are also caustics of a varying degree of activity, but, with the exception of glacial acetic, are seldom used for this purpose. The sulphates of zinc and copper and dried alum are employed as mild caustics to exuberant granulations. The actual and galvano-cauteries are much used for this purpose.

SUPPURANTS.

What two drugs may be so classed?

Oleum Tiglii.—Croton oil, applied with friction to the skin, produces an inflammation accompanied by a pustular eruption. For purposes of counter-irritation it is applied either undiluted or mixed with one or two parts of olive oil or oil of turpentine to the chest in chronic bronchitis and allied conditions, and to rheumatic joints.

Unguentum Antimonii.—This preparation produces effects similar to those of oleum tiglii, and may be used in similar conditions, but is a more painful application.

IRRITANTS.

Under this subdivision may also be considered two drugs which, although they do not possess vesicant, rubefacient, or escharotic action, are much used by the dermatologist.

Sapo Viridis (green or soft soap).—Green soap is prepared from potassa and the fixed oils, and is chemically a combination of the oleate, stearate, and palmitate of potash. It is a soft, greenish soap of the consistency of jelly, and is very soluble in water and alcohol. Owing to the potassa it contains it is an irritant, and constitutes an invaluable preparation for local application in the scaly skin diseases, as in the scaly forms of *eczema*, and in *scabies*. As an alkali it is an efficient antidote to *acid-poisoning*, and possesses the advantage of being generally available. Too long continued, it may produce decided irritation of the skin.

Chrysarobinum.—Chrysarobin is an orange-colored, tasteless, odorless, and crystalline powder, insoluble in water, slightly soluble in alcohol, and freely soluble in ether. It is a *mixture of principles* extracted from *goa-powder*, which is found in the wood of *Andira araroba*, a Brazilian tree, and is present also in *Rheum officinale* and other varieties of rhubarb.

Effects and Uses.—Its internal effects are disputed, but gr. v–vij prove purgative. Applied to the skin, it produces a *yellow* stain, causes irri-

tation, with at times œdema and a furuncular inflammation. In the treatment of *psoriasis* it is a specific, and it is also employed with success in the other scaly skin diseases. The officinal (10 per cent.) ointment often proves too irritant for the skin, and has to be diluted with one or two parts of some simple ointment.

DEMULCENTS.

What are demulcents?

Demulcents are substances, consisting chiefly of gum or mucilage, which soften and relax the tissues and diminish the heat, tension, and pain of inflamed areas. As most of them contain sugar and starch, their constitutional effects are chiefly nutritive. They are employed internally to relieve severe gastro-intestinal irritation, as after the ingestion of irritant poisons or other acute inflammations; to affect reflexly slight bronchial inflammations, and locally those of the pharynx and larynx; and as light diet for the sick. Externally, they are extensively employed to relieve the symptoms of burns, wounds, etc., while in pharmacy they are much used to suspend substances insoluble in water. A very common form for external use is the *poultice* or *cataplasm*, which consists of these mucilaginous and starchy substances made into a soft consistency with water. They form a convenient method for the application of heat and moisture, and have already been sufficiently considered.

AQUA (WATER).

What are its uses?

Water fulfils important dietetic, medicinal, and pharmaceutical uses. It aids in the solution and digestion of food, the metamorphosis and construction of tissue, and is said to increase the total solids eliminated by the urine. It is the *best of demulcents*, and as such is much used. The ingestion of too large amounts, however, causes disturbances of digestion. For pharmaceutical purposes distilled water (aqua destillata) should alone be employed.

ACACIA (GUM ARABIC).

What are its source and principal ingredient?

Acacia is a *gummy exudate* from *Acacia verek* and other species of Acacia, a small African tree. Several varieties of gum Arabic are known, all of which are somewhat transparent, hard, and pulverizable. They are odorless, and have a somewhat sweetish taste. They are almost wholly made up of *arabin*, which is soluble in water, forming mucilage, from which solution it is precipitated by alcohol.

What are its effects and uses?

Gum arabic is not digestible, and its only effect is that of a demulcent,

for which it is used in gastro-intestinal conditions, as diarrhœa, dysentery, acid-poisoning, etc., and as a lubricant in catarrhal affections. It is much used as a vehicle for anodynes and expectorants in cough mixtures. The following *preparations* are officinal:

Pulvis Acaciæ,
Mucilago Acaciæ,
Syrupus Acaciæ,
} used as vehicles; dose ad lib.

TRAGACANTHA (TRAGACANTH).

What is this drug?

Tragacanth is a gummy exudation from *Astragulus gummifer* and other varieties of Astragalus, small shrubs of Asia Minor. It occurs in odorless and nearly tasteless flakes, and when heated and water added it swells up and forms a paste without actual solution. Its chief constituents are *arabin* (or a similar substance) and *tragacanthin*. Its chief use is for suspending heavy insoluble powders and to give a proper consistency to lozenges.

Tragacantha and Mucilago Tragacanthæ are officinal.

CETRARIA (ICELAND MOSS).

What is cetraria?

Cetraria, or Iceland moss, is a lichen, *Cetraria Islandica*, chiefly obtained from Iceland and Norway. It contains a starch, *lichenin*, and a bitter principle, *cetrarin*. It imparts its bitterness to cold and all its virtues to boiling water. It is a highly nutritious demulcent, and may be used in jelly, the bitter principle having first been removed by soaking in cold water.

CHONDRUS (IRISH MOSS OR CARRAGEEN).

What can you say of chondrus?

Irish moss consists of the *fronds* of *Chondrus crispus*, a sea-weed found on the coast of Ireland and the Northern United States. Its active principle, *carrageenin*, is a substance somewhat resembling starch, but not giving the characteristic iodine reaction. Boiled in water, it yields a solution which gelatinizes on cooling. It is a nutritious demulcent, and is given as an article of diet to the sick in the form of decoction with suitable flavoring, or with milk as *blanc mange*.

ULMUS.

What are its points of interest?

Ulmus, or slippery elm, is the inner *bark* of *Ulmus fulva*, an indigenous tree. It contains a large amount of mucilaginous matter and some tannic acid, and has found employment in catarrhs of the intestinal

and genito-urinary tracts. It possesses considerable nutritive value as well, and it is used externally in poultices.

Mucilago Ulmi is officinal, and is used as a demulcent drink.

GLYCYRRHIZA (LICORICE).

What are its sources, constituents, and uses?

Licorice is the *root* of *Glycyrrhiza glabra*, a plant of Southern Europe. Its long fibrous roots have no odor, but a sweet mucilaginous taste, which they owe to a glucoside, *glycyrrhizin*, soluble in boiling water and alcohol. Licorice is used as a demulcent and as a flavoring agent to disguise the taste of unpleasant drugs. The cortex of the root is acrid and possesses no demulcent properties. It has many preparations:

Extractum Glycyrrhizæ,
Extractum Glycyrrhizæ Purum,
Extractum Glycyrrhizæ Fluidum,
} used as flavoring agents.

Trochisci Glycyrrhizæ et Opii; each contains opium gr. $\frac{1}{10}$.

Pulvis Glycyrrhizæ Compositus. See *Senna*.

Mistura Glycyrrhizæ Composita (brown mixture), a favorite vehicle for cough mixtures; contains extr. glyc. purum, acacia, sugar, spt. ætheris nitros. āā. 3 parts, paregoric 12 parts, wine of antimony 6 parts, with water to 100 parts.

LYCOPODIUM.

What are the uses of lycopodium?

This drug consists of the *sporules* of *L. clavatum*, or club-moss, and other varieties of Lycopodium, plants of Europe and America. It occurs as a fine yellow powder, which is much used as a dusting powder, not being moistened by water. It is also used in pharmacy to prevent pills from adhering together.

LINUM (FLAXSEED).

What does flaxseed contain?

The *seeds* of *Linum usitatissimum*, or common flax, contain large quantities of *mucilage* and *oil* (oleum lini). It is the most common basis for poultices, and is used internally as a demulcent, sometimes in infusion, but preferably in decoction.

AMYLUM.

What are its sources and chemical properties?

Amylum, or starch, is officinally the *fecula* of *Triticum vulgare*, or wheat, but is, as is well known, a proximate principle found in a large variety of plants throughout the vegetable kingdom. It is a carbohydrate ($C_6H_{10}O_5$). By boiling it with dilute sulphuric or hydrochloric

acid it is converted into an isomeric principle, *dextrin*, and this in turn into *glucose*, or grape-sugar.

What are its effects and uses?

The starches are an important group of nutrients, the consideration of whose physiological history falls more properly elsewhere. It is used as a dusting powder, as a constituent of poultices, and is the antidote for iodine.

Mention other demulcents.

Other drugs possessing similar qualities are—
Althæa, the *roots* of *Althæa officinalis.*
Cydonium, *seeds* of *C. vulgare*, or quince; mucilage officinal.
Sassafras Medullæ or sassafras *pith.*

EMOLLIENTS.

Emollients are bland substances, principally of a fatty nature, which are used externally to soften the skin and render it pliable.

LANOLINE.

Has it any advantages?

Lanoline is a fat constituting about 45 per cent. of the wool of sheep, and consisting of the secretion of the sebaceous follicles. It contains *cholesterin.* When first introduced the property of being quickly absorbed, together with that of impregnating substances, was claimed for it, but recent experiments have apparently disproved this.

GLYCERINUM.

What can you say of its manufacture and uses?

Glycerin, which is chemically *propenyl alcohol*, is liberated from its combinations with the fatty acids (stearic, margaric, oleic, etc.) during the process of saponification, when these acids unite with an alkali. In this form, however, it is impure and apt to be irritant. The purest and blandest forms are derived from this soap-waste by a patented process, but the largest amounts are made by passing superheated steam through fats. Glycerin is a thick, colorless liquid, with a sweet, slightly burning taste. It mixes in all proportions with alcohol, oils, and water, and is itself a solvent for iodine, bromine, tannic and vegetable acids, salicin, and many neutral salts, etc. It is very *hygroscopic* and *does not evaporate.*

The use of glycerin as a nutrient and alterative has now been abandoned, and it is chiefly used topically. Either in its own form or in combinations in various *creams* it is employed in chapped skin, excoriations, seborrhœa, and other skin diseases. Even in its purest forms it is irritant to some skins. For a similar emollient effect upon the mucous membranes it is used in coryza and laryngitis. Internally, it exerts a mild

laxative effect, but its chief use is to disguise the taste of unpleasant medicines, as castor oil, turpentine, iron solutions, etc.; also as a substitute for sugar in diabetes, but it possesses no curative properties.

SACCHARIN.

Its properties and uses?

Saccharin is a complex, white, crystalline, *intensely sweet* powder, slightly soluble in water, with which it forms an acid solution, and readily soluble in glycerin, alcohol, and ether. Even in large amounts it produces no marked physiological effects. It is chiefly of use where sugar is contraindicated for any reason, as in *diabetes* or *obesity*. It acidifies the urine and prevents decomposition, and may be used with advantage in conditions where the urine is ammoniacal, as from cystitis, etc.

PETROLATUM.

What is it?

Petrolatum is a yellowish, translucent, semi-solid mixture of substances of the marsh-gas series. It is obtained by distilling off the more volatile parts of crude petroleum and purifying the residue. It is insoluble in water and alcohol, but readily soluble in ether, chloroform, oil of turpentine, and the fixed and volatile oils, and melts at a temperature of 105° to 125° F. It is similar to various proprietary substances, as vaseline, cosmoline, etc., and was introduced as a substitute for them. Paraffin is the basis of all these preparations.

What advantages does it possess?

The advantages of these hydrocarbon oils consist in their freedom from odor and acridity and their lesser liability to become rancid.

What are its effects and uses?

Petrolatum in any ordinary dose does not produce physiological effects. Its chief use is as a *protective external application* and as a basis for ointments.

What other substances are used for similar purposes?

Adeps (lard), a mild fat melting at the body temperature and largely used in pharmacy, often as *adeps benzoinatus*, which contains 2 per cent. of benzoin.

Oleum Theobromæ (cacao butter), a fixed oil expressed from the *seeds* of *Theobroma cacao*, a tropical plant of South America: it is a bland vegetable fat, solid at ordinary temperatures, but melting at that of the body, and is much used in suppositories.

Cetaceum (spermaceti), a concrete fatty substance obtained from the sperm whale: used to give consistency to ointments. **Ceratum cetacei** contains spermaceti 10, white wax 35, and olive oil 55 parts.

Cera alba (white wax) and **Cera flava** (or yellow wax) are both used for the same purposes as spermaceti.

PROTECTIVES.

What are protectives?

The name "protectives" is applied to a class of remedies which are used medicinally to exclude the air from and protect inflamed superficial tissues.

GUN-COTTON.

What is gun-cotton?

Pyroxylinum, or *soluble gun-cotton*, is made by macerating cotton in a mixture of *nitric* and *sulphuric* acids, and afterward washing with water and drying. The officinal pyroxylin is not so highly nitrated as other varieties of gun-cotton, and is more soluble. It resembles ordinary cotton in appearance, but is harsh to the touch. It is used in medicine only in making collodion.

COLLODIUM (COLLODION).

What are its physical properties, varieties, effects, and uses?

Collodion is a colorless, syrupy liquid with a strong odor of ether. It consists of pyroxylin 4, stronger ether 70, and alcohol 26 parts. When applied to the dry skin the menstrua quickly evaporate, leaving a thin, flexible, and very contractile film. It may be used as a protective to wounds and bed-sores or for the coaptation of the edges of incised wounds. It is also valuable for the solution of medicinal substances, as cantharides, capsicum, etc. when these are applied locally. When it contains *tannic acid* it is called collodium stypticum.

Collodium flexile, or flexible collodion, contains castor oil 3 and Canada turpentine 5 parts, and shrinks very little on drying—a decided advantage in many cases. It is slightly irritant from the turpentine.

Cantharidal collodion has already been considered under *Epispastics*.

GUTTA-PERCHA.

What are its points of interest?

Gutta-percha is the concrete *exudation* of *Isonandra gutta*, an East Indian tree. A 9 per cent. solution in chloroform is officinal as liquor gutta-perchæ, and when applied to the skin forms a thin adhesive film which constitutes an elegant protection for small cuts, fissures, etc. in domestic practice.

Mention some other protectives.

Certain plasters, as **Emplastrum Resinæ, Emplastrum Plumbi, Emplastrum Saponis**, etc., are also used as protectives to denuded

surfaces. They should be spread upon very soft kid, and should be fresh enough not to have lost their plasticity.

ANTACIDS.

What are antacids?

Antacids are remedies employed to neutralize excessive acidity of the gastric and intestinal contents. This acidity may be due to *hypersecretions* or to fermentation of undigested food. In a wider sense antacids are substances which enter the blood, increasing its alkalinity and that of the secretions. The alkalies and alkaline earths and their carbonates are included in this class. Given before the ingestion of food, alkalies increase the acid secretion; after meals, they help to neutralize this acidity. For the former purpose smaller doses are given than for the latter.

SODIUM.

The arseniate, bromide, nitrate, phosphate, sulphate, and many other sodium salts having peculiar effects due to these constituents have already been mentioned.

What preparations of soda are antacids?

The following salts will here be considered:

Liquor Sodæ, a colorless, unpleasant-tasting liquid, containing about 5 per cent. of sodium hydrate.

Sodii Carbonas (carbonate of soda) occurs as colorless crystals, *effloresc ing* to a white powder and very soluble in water.

Sodii Carbonas Exsiccatus, which is formed by heating the carbonate and driving off its water of crystallization.

Sodii Bicarbonas, prepared by saturating solutions of the carbonate with CO_2, occurs in white, opaque, *permanent* crystals, odorless and of a cooling saline taste and slightly alkaline reaction. Soluble in 12 parts of water and insoluble in alcohol.

What are the effects and uses of the carbonate and bicarbonate?

These salts may be employed as *antacids*, *antiplastics*, and *diuretics*: they are less irritant and more palatable than the corresponding potassium salts. Of the two, the bicarbonate is the less irritant and more agreeable, and is used in many effervescing mixtures. Locally, it is a valuable domestic remedy, as ordinary *baking soda*, for burns, scalds, and the bites of insects.

CALX (LIME).

What are the different properties of slaked and unslaked lime?

Unslaked lime is a powerful corrosive, and is used in Vienna paste (potassa cum calce). Slaked lime possesses properties due to its alkalinity and slight astringency.

LIQUOR CALCIS.

What is it?

Lime-water is a saturated solution of lime containing *15 per cent. of calcium hydrate.* It is colorless, odorless, and of a somewhat disagreeable alkaline taste. Unless kept tightly corked it absorbs CO_2 from the atmosphere, and calcium carbonate is precipitated.

What are the effects and uses of lime-water?

It combines antacid and astringent properties. Internally, it is used in cases of *gastric irritability*, small amounts of milk and lime-water in varying proportions being a valuable and frequently used remedy for checking *vomiting.* It is also of value in *diarrhœas* of fermentative origin, and is suitable as an antidote for poisoning by acids, as sulphuric and oxalic. *Externally*, it is used in certain skin diseases, *prurigo*, *scabies*, and especially *tinea capitis*, and as an injection in *leucorrhœa* and *gleet.* Inhaled or administered by atomization, it will dissolve diphtheritic exudations.

Linimentum Calcis, or Carron oil, is an invaluable soothing application to relieve the pain of recent burns.

SYRUPUS CALCIS.

Why is it particularly efficient?

Lime dissolves more readily in syrup than in water, and the syrup contains about 5 per cent. It is twenty-four times as strong as lime-water, and is a useful astringent in diarrhœas. It may be used as an antidote in poisoning by carbolic or oxalic acid, but is not the best. Dose ʒss–ij.

Calcii Carbonas (calcium carbonate or chalk) is a native product of physical properties too well known to require description. It is insoluble in water, but soluble in dilute hydrochloric acid.

Creta Præparata (prepared chalk), made from the above by levigation and elutriation, a white, perfectly smooth powder, generally dispensed in small cubic cakes; dose gr. x–xxx.

Calcii Carbonas Præcipitatus, formed by the reaction of calcium chloride and sodium carbonate, and existing as a white, smooth powder; dose gr. x–xxx.

What are the effects and uses of these preparations?

Prepared chalk and the precipitated carbonate possess similar properties and equal efficiency. They act as *antacids* and *slight astringents*, and form very valuable remedies in diarrhœas where an antacid is indicated. They are also used in *dyspepsia*, the *gouty diathesis*, and in *rachitis.* Externally, they are employed as *desiccants* and *protectives* to excoriated surfaces.

What other antacids may be mentioned?

The preparations of potassium, the effervescing preparations of magnesium, and the aromatic spirit of ammonia are often used as antacids.

ANTISEPTICS, DISINFECTANTS, GERMICIDES.

Define these terms.

Disinfectant and *antiseptic* are terms which for the most part are used interchangeably. Antiseptics are substances which prevent putrefaction or septic decomposition. *Germicides* are remedies which *destroy disease-producing germs* or *their spores.* The same substances may thus be both antiseptics and germicides, depending on their concentration. All germicides are necessarily antiseptics, but not all antiseptics are germicides.

What are the necessary conditions for putrefaction, etc.?

Putrefaction ordinarily, and the septic processes of human pathology as well, require certain conditions for their development: (1) Organic substances capable of easy disintegration; (2) certain conditions of heat, air, and moisture; (3) certain ferments, which in most cases are living organisms, generally vegetable. If any of these conditions are wanting, these processes cannot take place. Thus, it is well known that extreme cold, the exclusion of air as in the domestic process of canning, and a very dry atmosphere will prevent or delay putrefaction. So, again, the destruction or exclusion of the ferments will produce the same effect; and it is here that the drugs and measures of this class find their field.

Name some physical disinfectants.

The most potent agent of this sort is *fire*, and by it contaminated clothing, etc. may be disposed of. Next in power, and first in importance, are *air* and *water*, which act as potent oxidizing agents. Free dilution of a poisoned atmosphere with pure air is all-important, and is our main reliance in rendering safe infected rooms and wards.

CALX (LIME).

What is its value as a disinfectant?

Lime is a destructive agent, causing a slow oxidation of organic matter. Oxidation is, as we have seen, a valuable means of disinfection. Lime is much used for disinfection of sewage, etc., but of late it has been claimed to have disadvantages, in that it causes the evolution of volatile gases which may carry noxious matter with them. It is an absorbent. Other uses of lime have been noted.

OZONE.

Ozone (O_3), an allotropic form of oxygen, is a powerful oxidizer. It is present in small proportion in the atmosphere, and undoubtedly is an important factor in Nature's antiseptic processes, but has not yet taken rank as a practical antiseptic. It is at present much used for the relief of distressing dyspnœa, as in asthma, pneumonia, et

HYDROGEN PEROXIDE.

What are its chemistry and uses?

This compound (dioxide of hydrogen, H_2O_2) gives up its oxygen easily, and is dispensed in a watery solution, slightly acidulated with HCl to give it stability, and yielding from 10 to 15 volumes of oxygen gas. It decomposes at a temperature of 60° F., and must be kept in a cool place. It is a powerful oxidizing agent and germicide, coagulating albumin, but not very irritant. It has been used to some extent internally, but its chief value is in *suppurating conditions of the ear, mouth, pleural cavity*, etc., and in *inoperable sinuses* generally, in which it acts as a stimulant antiseptic.

POTASSII PERMANGANAS.

What is the nature of its antiseptic properties?

This drug, already mentioned elsewhere, contains a large amount of readily available O_2, to which it owes its antiseptic power. It is a powerful antiseptic, but of very short duration, being quickly deprived of its oxygen and rendered inert. As a practical germicide its value is not great, because the organic matter in which the noxious elements are present so quickly deprives it of its oxygen. It is a good *deodorizer*, and is of considerable service, locally, in such offensive surgical conditions as *fœtid ozæna, otorrhœa, leucorrhœa, foul and sloughing ulcers*, cancerous or otherwise. The usual strength is 1 : 500 or 1 : 1000, but much stronger solutions may be used.

ACIDUM SULPHUROSUM (SULPHUROUS ACID).

For what is it employed?

This is, of all disinfectants, the most commonly employed for the disinfection of rooms. It acts as a *deoxidizing* agent, breaking up organic compounds, and becoming sulphuric acid in the process; but probably its efficiency is due to a direct but not powerful germicidal effect, and it is said not to affect spores. The usual method of employment is to burn sulphur in a tightly-closed room, allowing from 20 to 30 ounces to every 1000 cubic feet of space, with proper precautions against fire. The officinal acid is a liquid containing 3½ per cent. of the gas.

HYDRARGYRI CHLORIDUM CORROSIVUM.

What of its power as a germicide?

This salt, *mercuric chloride* or *corrosive sublimate*, is so much used in surgical procedures as to warrant detailed notice. As a germicide it is particularly powerful, solutions of 1 : 20,000 quickly destroying micrococci and bacilli, while 1 : 2000 will destroy the most resistant spores. It is decomposed by ammonia—a fact which lessens its value as a disinfectant—but it still remains one of the best measures for this purpose. It is

much used (1 : 1000) for disinfecting bedding, etc., and in stronger solutions for destroying the germs in alvine discharges. It is indispensable as an antiseptic in surgical operations for disinfecting the field of operation, hands, sponges, dressings, etc., but corrodes instruments, which should be kept in solutions of carbolic acid or in sterilized water.

Notice has been already taken of the antiseptic properties of carbolic and salicylic acids, iodoform, iodol, thymol, creolin, etc.

ACIDUM BORICUM (BORIC ACID).

What are its properties, effects, and uses?

Boric (or boracic) acid occurs in transparent, white, hexagonal plates, of oily feel, permanent, and soluble with a slightly acid reaction in 25 parts of water, more so in glycerin and alcohol. It is a good antiseptic, but possesses only weak germicidal effects. Internally, it acidifies the urine. It forms a very useful antiseptic wash in some conditions of the mucous membranes, as *cystitis*, *conjunctivitis*, *sordes*, etc., producing antiseptic results with very slight irritation. Absorbed or taken in large amounts, it is said to produce gastro-enteritis, but such effects must be rare.

What is "Thiersch's solution"?

A combination much used in the surgery of mucous membranes, as the bladder, oral and nasal cavities, etc., is that of Thiersch, or "boro-salicylic," which contains of salicylic acid 2 and boric acid 12 parts, in water to 1000 parts.

SODII BORAS (BORAX).

How does borax differ from boracic acid?

This salt differs from the acid principally in being effloresceent, and in forming *alkaline* solutions with water, in which it is soluble, 1 : 16. It is insoluble in alcohol and freely soluble in glycerin. Its alkaline reaction gives it antacid properties, and as a combined *antacid* and *antiseptic* it finds its chief value in aphthous, diphtheritic, and other inflammations of the mouth and throat. Claims of utility in *epilepsy* have been made for it.

AQUA CHLORI (CHLORINE-WATER).

What are its manufacture and properties?

This preparation, in which form alone chlorine is officinal, is made by the reaction of manganese binoxide and HCl. It is a clear, greenish-yellow liquid, containing 0.4 per cent. or more of Cl, and having the unpleasant odor and taste of that element.

What are its effects and uses?

Chlorine gas acts as an *indirect* oxidizing agent, uniting with the hydro-

gen of organic matter and liberating O_2, which rapidly destroys the organic compound. It is a *powerful germicide*, an hour's exposure to a *moist* atmosphere containing 1 per cent. of the gas being sufficient to destroy all spores; but it is a decided respiratory irritant, and somewhat destructive to textile fabrics, especially if colored. Chlorine-water has been used internally in doses of ʒss to ʒij, well diluted, as an intestinal disinfectant, but probably is of no value. In proper dilution it is a good disinfectant and stimulant wash for *foul ulcers*, and as a gargle in *scarlet fever* and *sore throat*. Chlorine gas is generally used in the form of

CALX CHLORATA (CHLORINATED LIME).

Chlorinated lime, or bleaching powder, is a compound of varying chemical nature resulting from the action of chlorine on calcium hydrate, and containing *at least 25 per cent. of available* Cl *gas*, which can be slowly set free by CO_2, more rapidly by the addition of an acid. It occurs in a white, dry powder of chlorinous odor and a disagreeable saline taste, gradually becoming moist and decomposing in the atmosphere.

What are its effects and uses?

It acts only locally, and may be used in the same conditions as chlorine-water. For the disinfection of rooms the room should be tightly closed, an acid added to hasten the evolution of the gas, and left for many hours. For the disinfection of rooms it is inferior to sulphur, but for that of excreta and infected filth generally a saturated solution is the most efficient known.

What is "Labarraque's solution"?

Liquor sodæ chlorinatæ, or Labarraque's solution, contains 2 per cent. of available chlorine. Upon this its effects and uses depend, and they correspond to those of calx chlorata. Its advantages lie in its liquid form and its comparative freedom from odor, so that it is a more elegant form for use.

AROMATICS.

What are their active principles and uses?

Drugs of this class owe their efficacy to oils obtained from them by distillation, and termed *volatile*, *distilled*, or *essential oils*. These oils are volatile, inflammable, soluble in alcohol and ether, and themselves dissolve fixed oils. Locally, they are used as (1) *counter-irritants*, (2) *local anæsthetics*, and (3) *antiseptics;* internally, as (4) *antispasmodics* or *carminatives* by stimulating the intestine and thus expelling flatus; as (5) *digestive aids*, (6) *diffusible stimulants*, and (7) to disguise the taste of unpleasant drugs. Following is a brief description of some of the most important ones, few of which require detailed notice:

Cinnamomum (*bark* of *Cinnamomum Zeylanicum*, a native of Ceylon) contains oleum cinnamomi (U. S.) and *tannic acid*. The oil

is much used to disguise the taste of unpleasant medicines. Aqua cinnamomi (2 per cent.) is also used as a vehicle. For the *aromatic* and *astringent* effects of the drug the *tincture* (3j–ij) and spirit (m̄x–xxx) may be employed.

Caryophyllus (cloves).—Caryophyllus is the *unexpanded flowers* of *Eugenia caryophyllata*, a small East Indian tree. Oleum caryophylli, to which it owes its efficiency, is officinal; dose m̄j–vj. It fulfils the general indications for aromatics mentioned above, and is much employed as a local anæsthetic in toothache. It is an efficient carminative and much-used spice.

Myristica (nutmeg), the *kernel* of the fruit of *M. fragrans*, a tropical tree, contains a fixed and volatile oil, the latter officinal—oleum myristicæ. Large doses produce narcotic effects. Although employed chiefly as a condiment, it is an agreeable flavoring agent, and is used to prevent the griping of cathartics and in diarrhœa. Besides the oil, the dose of which is m̄ij–v, spiritus myristicæ is officinal in 3j doses.

Macis (mace), another portion of the same fruit, contains the same volatile oil and fulfils the same indications.

Pimenta (allspice), unripe *berries* of *Eugenia pimenta*, contains a volatile oil (oleum pimentæ, U. S.), the dose of which is gtt. ij–v. Habitat, South America.

Cardamomum (cardamom), *fruit* of *Elettaria cardamomum* of the East Indies, contains a *volatile oil*, *fixed oil*, starch, etc. It is very agreeable to the taste, and much employed as a carminative and to conceal the taste of unpleasant medicines. Tinct. cardamom. comp. is an elegant vehicle for castor oil and other drugs.

Zingiber (ginger), the *dried root-stock* of *Z. officinale* of the East and West Indies, in its various preparations, officinal and proprietary, is a domestic remedy for colic, and is used as a stomachic in dyspepsia, especially when accompanied by flatulence. Its preparations are—

Oleoresina Zingiberis, dose m̄ss–ij.

Extractum Zingiberis Fluidum, dose m̄x–xxx.

Syrupus Zingiberis, dose 3j–ij.

Tinctura Zingiberis, dose 3ss–j.

Piper.—Black pepper is the *dried unripe berry* of *Piper nigrum*, containing a *volatile oil*, an *acrid resin*, and an *alkaloid* (*piperine*) which was once supposed to possess antiperiodic properties. Its effects are those of a *carminative stimulant*.

Its preparations are—

Oleoresina Piperis, m̄ij–j (in pill).

Piperina, dose gr. j–v.

Capsicum, already mentioned under *Irritants*, has a distinct value in feeble digestion, and especially that of drunkenness. It is said to be of value locally in acute tonsillitis and scarlatinal sore throat, either the diluted tincture as a gargle or pure applied with a swab.

Other frequently-employed flavoring vehicles are **Oleum Sassafras**, ***Aurantii* Amari Cortex**, and **Aurantii Dulcis Cortex**.

DIETETICS.

What are the uses of foods, and what their therapeutic importance?

Naturally, but a brief résumé of this extensive subject can be attempted in a treatise of this kind. The importance of foods as remedial agents in various forms of disease cannot be overestimated, for on them mainly we rely to repair tissue-waste, while the regulation of the diet in certain diseases, notably acute febrile conditions, gastric disorders, and nephritis, is all important. The ultimate uses of food, then, are to *repair tissues*, and to *supply energy*, which is manifested in muscular, secretory, and nervous activity, etc.

How may food-stuffs be classified?

The various aliments may be classified under the following groups: I. *Mineral* substances, which enter into the composition of tissue, are incapable of further oxidation, but perform certain necessary functions in the human economy—*i. e.* water, calcium phosphate, sodium chloride, etc.; II. *Substances capable of further oxidation*, with the production of *heat* and *energy*, or of being stored up as tissue, which secondarily undergoes oxidation with the same effects. This forms the most important group, and includes *proteids*, *fats*, *carbohydrates* (sugar, starch, etc.); III. *Food adjuncts*, including tea, coffee, alcohol, etc. A convenient classification of foods for purposes of consideration is into *animal* and *vegetable foods.*

ANIMAL FOODS.

What is the composition and food-value of milk?

A perfect food, then, must contain *proteids*, *fats*, *carbohydrates*, *salts*, *and water*. The nearest approach to this we find in milk, a good specimen of which contains all these requisites and is an ideal food. An analysis of milk shows proteids (casein and albumin), fats (cream) carbohydrates (lactose or sugar of milk), salts (chlorides, sulphates, and phosphates), and water.

What substitutes may be employed for mother's milk?

In infant feeding, when for any reason the breast-milk is not available, the following substitutes may be employed: (1) *Good fresh cow's milk properly prepared.* Woman's milk differs from that of the cow in containing larger amounts of sugar and of albumin, but a smaller amount of casein, which coagulates in smaller flocculi. This casein in cow's milk coagulates into a denser mass, it being intended for further mastication by the young ruminant. To make cow's milk as nearly as possible resemble the infant's natural food, it should be diluted with water, lime-water, barley-water, etc. The proportion of diluent should be greater the younger the infant; thus, under six weeks of age nearly *one-half* should be added, from six weeks to two months *one-third*, and after that

age *one-quarter*. *Lactose* (ʒij to Oj) and *cream* should then be added to make good the deficiency of these ingredients. In this way the casein coagulation is affected by *dilution*. (2) It may also be affected and its digestion assisted by *peptonized milk powders*. (3) *Condensed milk* of good brands constitutes another very valuable means of infant feeding, especially in cities, where obtaining wholesome cow's milk is wellnigh impossible. This consists generally of a thick, viscid, semisolid mass, obtained by evaporating milk at a gentle heat and adding sugar to preserve it. Its indefinite strength is a disadvantage, rendering its proper dilution rather problematic, but most infants do well under its use. (4) *Sterilized milk* is also of great value in bottle-feeding during the summer months, and is a prophylactic and curative agent in diarrhœal disorders.

What are unwholesome modifications of milk?

Milk obtained from cows during the first two or three weeks of lactation contains more or less *colostrum*, which gives it an unpleasant odor and taste and some purgative properties, and renders it unsuitable for feeding children. Milk from cows during advanced pregnancy, during and for some days after "heat," or when suffering from inflammation of the udder, is unwholesome. Poisonous pasturage may affect milk. Cows suffering from tuberculosis, anthrax, foot-and-mouth disease, etc. should not be utilized for milking purposes: tuberculosis and anthrax have without doubt been thus communicated to man.

What other diseases may be caused or conveyed by milk?

Scarlet fever and *diphtheria* have been conclusively proven to have been thus transmitted; at least in the case of the former a very similar disease exists in the young animal. *Typhoid fever* has at times been traced to milk. *Tyrotoxicon-poisoning.*—As the result of certain putrefactive changes, due here as elsewhere to micro-organisms, a poisonous principle called "tyrotoxicon" is developed; milk or milk products, as ice cream, cheese, etc., containing this poison give rise to the symptoms of irritant poisoning—viz. *nausea, violent vomiting, burning pain in the throat, œsophagus, and stomach*, diarrhœa, and profound depression, lasting for a few hours and generally ending in recovery. While the symptoms are very distressing and severe, the autopsies in fatal cases have been almost negative, the lesions of gastro-enteritis being almost entirely absent. From this it has been inferred that the poison exerts a purely centric effect.

In what conditions is a milk diet indicated?

Full milk diet consists of from 4 to 6 pints of milk daily. Many patients will not be able, however, to consume even the smaller of these amounts, the fats being in greater quantity than they can assimilate. The customary method of administration is to give a glassful (ʒvj–viij) every two hours. Some patients have an idiosyncrasy and really cannot *take it*. Many more will say they cannot, but after a thorough trial will

generally succeed. Lime-water, Vichy, common salt, etc. may make it more palatable and better borne. Its use is indicated in *pulmonary tuberculosis* and *wasting diseases generally*. The object of its administration in these cases is to promote tissue-formation: the patient's digestion must be good, and no more should be taken than can readily be assimilated. In *febrile conditions* generally it forms an easily digested food. In *chlorosis* and the *severer anæmias* forced feeding with plenty of milk is a valuable adjuvant to drugs. In *albuminuria* an exclusive milk diet will generally greatly ameliorate the symptoms, and may cause the entire disappearance of albumin from the urine. In *gastric ulcer*, *toxic gastritis*, and *typhoid fever* it is the only permissible food, while in *carcinoma of the stomach*, *dyspepsia*, and *severe gastralgia* it may give relief. In diarrhœas, dysentery, and chronic intestinal indigestion it leaves no indigestible residue to ferment and irritate, and often proves efficacious.

What are the unpleasant effects of prolonged milk diet?

The continued use of milk is apt to prove repugnant to the patient. It tends to constipate, the cases in which it produces diarrhœa being due to lack of assimilation and consequent fermentation and irritation. A decrease of body-weight often occurs, and the patient may experience disagreeable sensations of emptiness, dizziness, and weakness. In rare cases these symptoms may be so pronounced as to necessitate its discontinuance.

DERIVATIVES OF MILK, AND THEIR PECULIAR PROPERTIES.

CREAM.

What does it represent?

This substance is obtained from milk by allowing it to *rise* or by *centrifugal force*. It is employed in making butter and cream cheeses. It represents most of the fat of the milk, of which constituent it contains from 25 to 33 per cent.

SKIMMED MILK.

Has it any food value?

Milk minus cream, or skimmed milk, still contains a fair amount of proteids and lactose, and hence has considerable value as food.

BUTTER.

How is it obtained? What causes its rancidity?

By agitation, or "churning," the fat of the cream is separated, and is known as butter. Butter presents fats in an easily digestible form, and contains of them about 85 per cent. Rancidity of this product is due to a fermentative process, resulting in the separation of the butyric and

other acids from their base, glycerin. It is hastened by the presence of too much casein or water from imperfect separation.

Buttermilk, the resultant liquid in butter-making, is a nutritious food; it contains casein, lactin, and salts. It is easily digestible, probably in consequence of the lactic acid it contains, and may be substituted for milk in *albuminuria*, *diabetes*, and *gastric* disease, constituting the so-called buttermilk cure for these disorders.

Cheese is made by coagulating the casein of milk by rennet and subsequent compression. The coagulating casein entangles the fats and some of the lactose and salts in its meshes, so that analyses of cheese show it to be a highly nutritious product. By the "ripening process," which lasts from four to six weeks, volatile, odorous constituents are developed, giving it its flavor. Although so highly nutritious, it is, in the main, hard to digest, and is not suitable for the sick. *Whey*, the liquid portion of the milk expressed during cheese-making, contains very little of nutritive value.

KOUMYSS.

How is it made? What are its constituents and uses?

Koumyss is an effervescing alcoholic drink obtained by fermentation of milk. Mare's milk was originally used, and is preferable, but cow's milk is now employed in its manufacture, lactose being added to give more sugar for fermentation, and thus greater alcoholic strength. Besides alcohol, this milk-product contains carbonic acid and certain ethers. During fermentation the milk separates in layers, the uppermost being koumyss and the lowermost casein. In good koumyss not all the casein should be precipitated, and *no sugar* should be present, as it should all have been changed to alcohol. It contains 1½ to 4 per cent. of alcohol, and, roughly speaking, is one-third the strength of champagne. It should be kept tightly corked and in a cool place, and should be frequently shaken.

Although its sour taste is disagreeable to some palates, it is surprisingly well borne by even the most delicate stomachs, and forms a valuable *stimulant* and *food* in cases of malnutrition from any cause, especially when accompanied by gastric disturbance. When first introduced it was claimed to be a specific in tuberculosis, but this claim is no longer made for it.

MATZOON.

What is matzoon? what are its uses?

Matzoon is milk which has undergone lactic-acid and not alcoholic fermentation, yet differs from sour milk in that the process is checked when a certain degree has been reached. It is said to be well borne by *irritable stomachs*.

PEPTONIZED MILK.

What are its advantages?

This artificial milk-product is of such undoubted value, and so indispensable in certain cases, that a somewhat detailed account of its preparation and uses may be given. Milk, as we have seen, is a perfect food. Two of its components, *lactose* and *fats*, are easily digested, but with the albuminoid, *casein*, the case is different, and by its partial or complete conversion into peptones the digestion of milk may be greatly facilitated.

What are the steps in peptonizing milk?

The steps in detail are as follows: The most convenient form in which to obtain the pancreatic principle is the various proprietary preparations of "extractum pancreaticum" or "pancreatin," which are dispensed in tubes mixed with varying proportions of sodium bicarbonate. Ordinarily, one of these tubes is sufficient for one pint of milk. To the contents of one tube add about ℥ij of water and stir thoroughly. Then add a pint of *warm* fresh milk, and keep the mixture at a temperature of 100° F. for thirty minutes, at the expiration of which time it is removed to a cool place—which checks the activity of the ferment—and kept until used. If the process be continued too long, certain products unpleasant to the taste, and perhaps poisonous, may develop. The bitter flavor should not be marked. By first removing the cream, then peptonizing, and then adding the cream again, a result more palatable and more milky in appearance is said to be obtained.

If suitable arrangements for regulating the temperature are not available, milk may be peptonized at the ordinary temperature of the sick-room, as follows: To a pint of milk, mixed with ½ pint of water, add 1½ tubes of the extract; then set aside for from four to five hours. and use *immediately*, or bring to a boiling-point to stop fermentation, and keep in a cool place.

What are the therapeutic uses of peptonized milk?

In *wasting diseases*, especially when more or less *complete anorexia* obtains, in the *persistent and intractable vomiting* of *chronic gastritis*, *uræmia*, *gastric congestion from cirrhosis*, or *chronic endarteritis*, and after *abdominal incision*, it may often furnish relief; in *gastric ulcer* small amounts of this or other artificially digested fluids form the most rational and efficient treatment.

EGGS.

In what alimentary principles are eggs rich?

The eggs of the ordinary domestic fowl form a highly nutritious article of diet, containing a *large proportion of nitrogenous matter* (14 per cent.) and a comparatively *small amount of non-nitrogenous*. In full diet, then, they should be combined with starchy and fatty food. The

fat of eggs is found entirely in the yelk, while the white of the egg is the more highly nitrogenous. In cooking, the albumin should be rendered simply opaque, as hard-boiled eggs are indigestible and cause constipation. To invalids uncooked eggs are given with milk and alcohol.

BEEF.

What are its chief constituents?

Roughly speaking, good beef contains about 20 per cent. of nitrogenous and 20 per cent. of fatty matter, with *salts*, *extractives*, etc. The nitrogenous elements are partly in solution (as myosin, the cause of *rigor mortis*) and partly solid. From its composition it is seen that beef contains nutritive principles of prime importance to the sustenance of the body.

Describe the changes of rigor mortis.

The normal alkalinity of the body fluids changes to acidity and the myosin is coagulated. Meat ordinarily should not be eaten until this subsides.

VEAL.

What about its digestibility?

Veal has the reputation of being more slowly digested than beef—an opinion due probably to the fact that it is more difficult to thoroughly masticate. It sometimes exerts a laxative effect, and is seldom used by invalids. It contains, roughly, 17 per cent. of nitrogenous and 16 per cent. of fatty substances.

MUTTON.

Although possessed of a lower nutritive value than beef, mutton is easily digested and forms a valuable article of diet for occasional use. Continued use leads to a repugnance to it, and in some an apparent idiosyncrasy exists against it. It contains a large amount of fat (about 40 per cent.) and between 9 and 10 per cent. of nitrogenous substances.

PORK.

Of all meats in common use, this is the hardest to digest, requiring between five and six hours for complete digestion. It is the fattest of meats, containing about 65 per cent. of fat and 8 per cent. of nitrogenous elements. With two exceptions it is not used for invalids, as it is not well borne by the stomach. Bacon, however, is well tolerated by many weak stomachs, and roast pig may at times be taken with advantage during convalescence. If tolerated by the stomach, pork is suitable for phthisical patients.

CHICKEN.

The flesh of the ordinary domestic fowl, combining as it does ease of

mastication and digestion with an agreeable flavor, is a valuable and much-used article of diet for the sick. Other domestic and wild fowl may often be of value.

What animal viscera are sometimes used for food?

Sweetbread, properly the *thymus* of the calf, but more often the pancreas, is an agreeable, nutritious, and easily digested food. *Tripe*, the stomach of the ox and other ruminants, combines the same qualities. The *brain* is also easily digested, and contains fats and phosphorus. *Liver*, although nutritious, is too hard of digestion for the sick. *Kidneys* are objectionable for both sick and well.

What fish are suitable for invalids?

Certain varieties of fish, as whitefish, bass, trout, etc., are suitable articles of diet for the sick. As a rule, they are easily digestible if boiled, in which way alone they should be served to invalids. Of shellfish, oysters are especially valuable. They are more easily digested when served uncooked, because the brown part of the oyster, the liver, is composed of *glycogen* and a ferment, *diastase*, the later of which, if not destroyed by heat, aids in digesting the former.

VEGETABLES.

What can you say of wheat?

Among the cereals wheat is the most important. Wheat bread, properly made, is easily digestible, nutritious, and nearly all assimilated, leaving very little residue. This fact accounts for its tendency to produce constipation. Bread made from unbolted flour is more nutritious, less apt to produce constipation, and, being less permeable to the digestive fluids, is less easily digested. Fresh bread is difficult to masticate thoroughly, and should not be served to invalids.

What of cracked wheat and its effects? Oatmeal? Cornmeal?

Cracked wheat, which is boiled until the envelope is burst, is eaten with cream and sugar, forming a pleasant, highly nutritious, and somewhat laxative food. *Oatmeal* and *cornmeal* are staple articles of food, and, prepared in various ways, are acceptable to the sick. Like the above, they are apt to produce a somewhat laxative effect.

What food-stuffs are largely farinaceous?

Starch, *sago*, *tapioca*, and *arrow-root* are quickly digested, and are largely used for the sick. They contain *no nitrogen*, and hence are not capable of maintaining life for any considerable time.

What of the composition and food-value of the potato?

Next to wheat, the ordinary potato is the most used vegetable in general diet. It contains a large amount of starch (about 16 per cent.) and small percentages of sugar and nitrogenous matters. Boiled to a dry and mealy condition, it may be used by the sick, but in no other condition is

it suitable for this purpose. The *sweet potato* differs chiefly in the larger proportion of sugar it contains, and is probably less easily digested. Other vegetables in common use are seldom used for sick diet.

SPECIAL PLANS OF DIET.

For what uses is low diet employed?

In *obesity*. For the reducing of superfluous fat it is necessary to largely interdict the saccharine, fatty, and starchy elements of food: of these, sugar is the most fat-forming, and should be very sparingly used. Various treatments of this sort have received the name of Bantingism.

In *aneurism*. By a combination of perfect rest in the recumbent position and extremely low diet, largely *dry*, a good effect may be produced upon internal aneurism.

What are the indications for dry diet?

A diet in which the amount of fluid ingested is limited may be of signal service in *dropsical conditions*, hydrothorax, ascites, etc. A satisfactory plan is to so limit the amount of fluids that the watery excreta are in excess of those ingested.

What are the indications for animal diet?

The chief indication for a more or less exclusive meat diet is found in *diabetes*. Most vegetables contain sugar or starch, which easily undergoes conversion into sugar, and they should be interdicted. Tomatoes, celery, and raw cabbage are about the only vegetables consistent with a strict diabetic diet. Gluten bread relieves to a degree the longing for wheat bread, which is ordinarily the greatest deprivation. Fats generally must be used freely. By a strictly meat diet nearly or quite all of the glucose may be made to disappear from the urine.

Meat diet also proves of value in *diarrhœa*, whether *acute* or *chronic*, and is indispensable in *cachectic conditions* generally.

What food is suitable for acute febrile conditions?

During acute inflammatory and febrile conditions all the organs of the body are subject to a degenerative process, and all the functions are to a greater or less degree impaired. This tissue-destruction is evidenced by a large increase in those excretory elements which represent tissue, especially urea, urates, phosphates, etc. On the other hand, the processes of constructive metamorphosis are incomplete. The digestion shares with others this lessened power. Hence the importance of administering such food as shall be most easily digested. As a general rule, in such conditions *milk diet is indicated*. Beef tea, which once enjoyed popularity for this purpose, is inferior in nutritive properties and more difficult of digestion. Digestibility, to be sure, may be enhanced by peptonizing (by a process similar to that given in detail under *Milk*), but *this does not* make good the inferior food value.

DISEASES OF THE ALIMENTARY TRACT.

What should be the alimentation in acute gastritis?

In all conditions our guiding principle should be to give the affected organ as nearly complete physiological rest as possible. Thus in acute gastritis small amounts of milk, milk with lime-water, milk with Vichy or carbonic waters, milk with barley-water, and demulcent drinks should be given frequently. Effervescent drinks, as champagne in small quantities, are generally well borne.

What should be the alimentation in chronic gastritis?

When for any reason there appears to be a deficiency of gastric juice, our aim should be to administer foods largely digested in the small intestine, such as starches, tapioca, arrow-root, rice, and the farinaceous vegetables generally. On the other hand, when *heartburn* (acid fermentation) occurs from fermentation of starchy and fatty foods, these articles should be taken sparingly.

What should be the alimentation in intestinal indigestion?

Again, in cases of *intestinal indigestion*, *summer diarrhœa*, and other conditions dependent upon functional or inflammatory disorders of the small intestine, foods entirely or for the most part digestible in the stomach should be given. Starches and fats should be interdicted, and nitrogenous foods, as milk, eggs, meats, should be administered.

What should be the alimentation in chronic constipation?

Here a suitable diet is of prime importance. Materials leaving a large amount of indigestible residue, as fresh vegetables, oatmeal, corn and brown bread, raisins, almonds, prunes, etc., may materially aid in overcoming this condition.

What should be the diet in cachectic conditions?

The objects to be attained are an increase of the muscular and fatty tissues. As fat-forming elements, *fats* (in milk, cream, meats), *sugar* (in its own form or in sweet fruits), and abundant starches are indicated. Thus, a combination of *nitrogenous* and *carbonaceous* foods is to be given, and freely. In severe anæmic conditions, as pernicious anæmia, Addison's disease, etc., frequent (or "forced") feeding may prove advantageous.

DIGESTIVE FERMENTS.

In this connection we may consider briefly certain physiological ferments which have to do with the digestive process.

PEPSINUM (PEPSIN).

What can you say of pepsin, its properties, and its preparation?

Pepsin is the digestive ferment of the gastric juice, and is obtained by

different methods from the mucous membrane of the hog's stomach. It is somewhat soluble in water, and freely so in water slightly acidulated with hydrochloric acid. The purest and most reliable pepsin is obtained by dissolving it in hydrochloric acid, drying, and diluting to a fixed standard, when it is known as saccharated pepsin: "1 part in an acidulated solution should dissolve 50 parts of egg-albumin in five or six hours at a temperature of 40° C." As first obtained, pepsin is a viscid fluid; dried upon plates and without artificial dilution, it is known as "scale pepsin." Alcohol checks the activity of the ferment, so that preparations made with wine and alcohol are inferior. Glycerin solutions are potent and keep well.

What are the uses of pepsin?

Naturally, the chief indication for its use is weakened digestive power. When hydrochloric acid is wanting or diminished in the gastric secretion, the addition of this element undoubtedly increases its value. Even at the standard strength indicated above (and few preparations approximate this) the doses habitually given could be of very little actual benefit unless a stimulant action upon the mucous membrane be supposed to take place; and some authorities are skeptical as to its real value. Acting as a ferment, however, its activity may be increased by repeating the dose of hydrochloric acid.

The *diarrhœa of children*, dependent upon imperfect gastric digestion, may be greatly benefited by pepsin. It has been suggested as a solvent for diphtheritic membranes and blood-clot in the bladder.

PANCREATINE.

Useful preparations of this important ferment exist both in the liquid and solid forms—liquor pancreaticus and extract of pancreatine. Given by mouth, it is probably rendered more or less inert by the gastric juice before it reaches an alkaline medium in which it can act. Its chief and great value is for the partial digestion of food before it is given. This artificial digestion of food has already been considered. (See *Peptonized Milk.*)

TABLE OF DOSES

OF REMEDIES MOST FREQUENTLY ADMINISTERED.

For hypodermatic use the dose should be *half* that used by the mouth.
For use by rectum the dose should be *twice* that used by the mouth.
Doses for Children.—Dr. Young's rule: Add 12 to the age, and divide by the age to give the denominator of a fraction, the numerator of which is 1.

Example: For a child two years old, $\frac{12 + 2}{2} = \frac{1}{7}$; the dose should be $\frac{1}{7}$th that for an adult. In giving powerful medicines and opium still smaller doses must be used for children.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Abstracta. (*See Extracta. Double the dose.*)		
Acetanilid (antifebrin)	2—15	0.1 — 1.
Acid. arsenios.	$\frac{1}{64}$ — $\frac{1}{32}$	0.001 — 0.003
benzoic.	5—15	0.3 — 1.
boric.	5—10	0.3 — 0.65
carbolic.	$\frac{1}{2}$ — 1½	0.03 — 0.1
gallic.	3—15	0.15 — 1.
hydrobrom. dil.	10—60	0.65 — 4.
hydrocyan. dil.	2— 6	0.1 — 0.35
hydrochlor. dil.	5—20	0.3 — 1.3
nitric. dil.	5—20	0.3 — 1.3
nitro-hydrochlor. dil.	5—20	0.3 — 1.3
phosphoric. dil.	5—30	0.3 — 2.
salicylic.	5—20	0.3 — 1.3
sulphuric. dil.	5—30	0.3 — 2.
sulphuric. arom.	5—15	0.3 — 1.
sulphuros.	30—60	2. — 4.
tannic.	2—10	0.1 — 0.65
Aconitina (white crystals)	$\frac{1}{300}$ — $\frac{1}{200}$	0.0002— 0.0003
Adonidin	$\frac{1}{10}$ — $\frac{1}{3}$	0.006 — 0.02
Agaricin	$\frac{1}{8}$ — $\frac{1}{2}$	0.008 — 0 015
Aloe	2— 5	0.13 — 0.3
Aloinum	$\frac{1}{2}$ — 3	0.008 — 0.18
Ammonii benzoas	10—20	0.65 — 1.3
bromid.	5—30	0.3 — 2.
carb.	3—10	0.2 — 0.65
chlorid.	10—30	0.65 — 2.
iodid., valer.,	2—15	0.1 — 1.
Amyl nitris (inhaled or internally)	2— 5	0.1 — 0.35
Amylene hydrate (hypnotic)	10—60	0.6 — 4.
Antimon. et pot. tart.; diaph.	$\frac{1}{20}$ — $\frac{1}{10}$	0.003 — 0.006
et pot. tart.; emetic	1— 2	0.06 — 0.13
Antipyrin	2—15	0.1 — 1.
Apiol	5—10	0.3 — 0.65
Apomorph. hydrochlor.	$\frac{1}{30}$ — $\frac{1}{15}$	0.003 — 0.006
Arbutin	5—15	0.3 — 1.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Argenti nitras	$\frac{1}{6}$ — $\frac{1}{2}$	0.01 — 0.03
Arsenii iodidum	$\frac{1}{64}$ — $\frac{1}{10}$	0.001 — 0.006
bromid.	$\frac{1}{64}$ — $\frac{1}{16}$	0.001 — 0.004
Atropinæ sulphas	$\frac{1}{128}$ — $\frac{1}{32}$	0.0005— 0.002
Auri et sodii chlorid.	$\frac{1}{32}$ — $\frac{1}{8}$	0.002 — 0.008
Bismuthi subnitras	5— 60	0.3 — 4.
Caffeina	1— 5	0.06 — 0.3
Calcii lacto-phosphas	5— 10	0.3 — 0.65
Calx sulphurata	$\frac{1}{10}$ — 1	0.006 — 0.06
Camphora	3— 10	0.2 — 0.65
Camph. monobrom.	2— 5	0.1 — 0.3
Capsicum	1— 5	0.6 — 0.3
Cerii oxalas	1— 10	0.06 — 0.6
Chinoidinum	3— 30	0.2 — 2.
Chloral	3— 20	0.2 — 1.3
Chloroformum	1— 30	0.06 — 2.
Chrysarobinum	$\frac{1}{2}$— 3	0.01 — 0.2
Cinchonidina, and its salts	5— 30	0.3 — 2.
Cocaina (locally, 1 to 4 % sol.), internally	$\frac{1}{16}$ — $\frac{1}{2}$	0.004 — 0.03
Codeina	$\frac{1}{16}$ — 2	0.004 — 0.13
Colchicin	$\frac{1}{160}$ — $\frac{1}{10}$	0.0006— 0.0013
Confectio sennæ	60—120	4. — 8.
Coniina, and its salts	$\frac{1}{100}$ — $\frac{1}{6}$	0.0006— 0.01
Copaiba	15— 60	1. — 4.
Creasotum	$\frac{1}{2}$— 5	0.03 — 0.3
Creolin (locally, $\frac{1}{2}$ to 2 % sol.), internally	$\frac{1}{2}$— 5	0.03 — 0.3
Croton chloral	1— 5	0.06 — 0.3
Cubeba	2— 60	0.12 — 4.
Cupri acetas	$\frac{1}{8}$— $\frac{1}{2}$	0.008 — 0.03
sulphas	$\frac{1}{16}$ — $\frac{1}{4}$	0.004 — 0.015
Curare	$\frac{1}{32}$ — $\frac{1}{16}$	0.002 — 0.006
Digitalinum	$\frac{1}{64}$ — $\frac{1}{32}$	0.001 — 0.002
Digitalis	$\frac{1}{8}$— 2	0.008 — 0.13
Elaterinum; U. S. P. 1880	$\frac{1}{60}$ — $\frac{1}{12}$	0.001 — 0.005
Ergota	15— 60	1. — 4.
Ergotinum	2— 8	0.13 — 0.5
Eserina, and its salts	$\frac{1}{64}$ — $\frac{1}{10}$	0.001 — 0.003
Extractum aconiti [rad.]; U. S. P. 1880	$\frac{1}{12}$ — $\frac{1}{4}$	0.005 — 0.015
aconiti [rad.], fluid.; U. S. P. 1880	$\frac{1}{2}$— 1	0.03 — 0.06
aloes aquos.	1— 10	0.03 — 0.65
bellad. alcohol.	$\frac{1}{6}$— $\frac{1}{2}$	0.01 — 0.03
bellad. fl.	1— 3	0.06 — 0.02
buchu fl.	30— 60	2. — 4.
calumbæ fl.	15— 30	1. — 2.
cannab. ind. (with caution)	$\frac{1}{16}$ — $\frac{1}{2}$	0.004 — 0.03
cannab. ind. fl. (with caution)	$\frac{1}{2}$— 1	0.03 — 0.06
cascaræ sagrad. fl.	10— 30	0.6 — 2.
cimicifugæ fl.	5— 30	0.3 — 2.
colchici rad. fl., colchici sem. fl.,	2— 8	0.12 — 0.5
colocynthidis comp.	5— 15	0.3 — 1.
conii fl.	1— 10	0.06 — 0.6
convallariæ rad. fl.	5— 30	0.3 — 2.
digitalis	$\frac{1}{2}$— 1	0.008 — 0.06
digitalis fl.	1— 6	0.06 — 0.4
ergotæ	$\frac{1}{2}$— 15	0.03 — 1.
ergotæ fl.	15— 60	1. — 4.
erythroxyli fl. (coca)	15—120	1. — 8.
eucalypti fl.	5— 30	0.03 — 2.
gelsemii fl.	2— 5	0.13 — 0.3
gossypii fl.	15— 60	1. — 4.
grindeliæ rob. fl.	10— 60	0.6 — 4.
guaranæ fl.	30—120	2. — 4.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Extractum hæmatoxyli	10— 30	0.6 — 2.
hydrastis fl.	10—120	0.6 — 2.
hyoscyami alcohol.	½— 2	0.03 — 0.13
hyoscyami fl.	2— 8	0.1 — 0.5
ignatiæ	½— ½	0.008 — 0.03
iridis fl.	5— 10	0.3 — 0.65
leptandræ fl.	20— 30	1.3 — 2.
lobeliæ fl.	1— 5	0.06 — 0.3
matico fl.	30— 60	2. — 4.
nucis vomicæ	½— ½	0.008 — 0.03
nucis vomicæ fl.	1— 5	0.06 — 0.3
opii	½— 1	0.008 — 0.06
physostigmæ	1/12— ½	0.004 — 0.01
pilocarpi fl.	5— 30	0.3 — 2.
podophylli	½— 3	0.03 — 0.2
prun. virg. fl.	30— 60	2. — 4.
pulsatillæ fl.	2— 5	0.1 — 0.3
quebracho fl. (aspidosperma)	20— 60	1.3 — 4.
rhei fl.	5— 30	0.3 — 2.
scillæ fl.	2— 3	0.1 — 0.2
scoparii fl.	15— 60	1. — 4.
scutellariæ fl.	15— 60	1. — 4.
senegæ fl.	1— 5	0.06 — 0.3
sennæ fl.	60—240	4. —16.
serpent. fl.	20— 30	1.3 — 2.
spigeliæ fl.	10— 60	0.6 — 1.
stillingiæ fl.	15— 45	1. — 3.
stramonii	¼— ½	0.015 — 0.03
taraxaci	5— 60	0.3 — 4.
ustilag. maid. fl.	15— 60	1. — 4.
uvæ ursi fl.	30— 60	2. — 4.
valer. fl.	30— 60	2. — 4.
veratr. vir. fl.	2— 8	0.1 — 0.5
viburni	15— 60	1. — 4.
xanthoxyli fl.	15— 60	1. — 4.
Fel bovis purif.	5— 10	0.3 — 0.65
Ferri arsen.	1/20— ½	0.003 — 0.01
bromid.	1— 5	0.06 — 0.3
carb. sacch.	2— 15	0.1 — 1.
et ammon. citr.	5— 10	0.3 — 0.65
et ammon. tartr.	5— 15	0.3 — 1.
et pot. tart.	10— 30	0.6 — 2.
et strychn. citr.	1— 5	0.06 — 3.
hypophosphis	5— 10	0.3 — 0.65
iodidum sacch.	2— 5	0.13 — 0.33
lactas	1— 3	0.06 — 0.2
oxid. hydrat. cum. magnes. (antidote to arsenic),	{f℥ ½ —f℥ 1 frequently}	16. —32.
pyrophosphas	1— 5	0.06 — 0.3
subcarb.	5— 30	0.3 — 2.
sulphas	1— 3	0.06 — 0.2
sulphas exsiccat.	½— 2½	0.03 — 0.15
valer.	1— 3	0.06 — 0.2
Ferrum dialys.	1— 15	0.06 — 1.
reduct.	1— 5	0.06 — 0.3
Gaultheria, oil of	3— 15	0.2 — 0.65
Guarana	8— 30	0.5 — 2.
Homatropinæ hydrobrom. (mydriatic, locally, 0.2 % to 4 %), internally,	1/6— 2½	0.01 — 0.15
Hydrarg. chlor. corros.	1/24— 1/12	0.001 — 0.006
chlor. mite	1/16— 10	0.004 — 0.65
iodid. rubr.	1/20— 1/12	0.0013— 0.006
iodid. vir.	¼— 1	0.02 — 0.06

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Hydrarg. subsulphas flav.	1/4 — 1/2	0.015 — 0.03
as emetic	2— 5	0.12 — 0.3
c. creta	3— 8	0.2 — 0.5
Hydrastin	3— 5	0.2 — 0.3
Hydrogeni peroxid. (10 vol. sol.), locally (25 to 100 %), pus destroyer; tonic-stimulant and antiseptic, *per os,*	30—120	2. — 8.
Hyoscinæ hydrobrom.	1/200 — 1/100	0.0003— 0.0009
Hyoscyaminæ sulph.	1/200 — 1/100	0.0003— 0.001
Hypnone	5— 10	0.3 — 0.65
Ichthyol (locally, 10 to 50 %), internally	3— 5	0.2 — 0.3
Infusum digitalis	f℥ 1—f℥ 4	4. —16.
Iodoformum	1— 5	0.06 — 0.3
Iodol	1/6 — 1/2	0.01 — 0.03
Iodum	1/10 — 1/4	0.006 — 0.015
Ipecacuanha (expect.)	1/2 — 1	0.01 — 0.06
Ipecacuanha (emet.)	15— 30	1. — 2.
Jalapa	15— 30	1. — 2.
Liq. ammon. acet.	f℥ 2—f℥ 8	8. —32.
acidi arseniosi, arsenii bromidi, arsen. et hydr. iod., potassii arsenit., sodii arseniatis, (*Commencing doses to be increased cautiously.*)	1— 5	0.06 — 1.
ferri chloridi	2— 10	0.15 — 0.65
ferri dialys.	10— 30	0.65 — 2.
potassii citrat.	f℥ 2—f℥ 4	8. —16.
Lithii benzoas	5— 20	0.3 — 1.3
bromid.	5— 20	0.3 — 1.3
carb.	2— 10	0.13 — 0.65
citras	5— 20	0.3 — 1.3
salicylas	5— 30	0.3 — 1.3
Lupulinum	5— 30	0.3 — 2.
Magnesii carb.	15— 60	1. — 4.
citr. gran.	℥ 2—℥ 8	8. —32.
sulphis	10— 30	0.6 — 2.
Mangani oxid. nigr.	1— 5	0.06 — 0.3
Massa copaibæ	5— 30	0.3 — 2.
ferri carb.	5— 15	0.3 — 1.
hydrarg.	1— 15	10.06 — 1.
Mist. asafœtidæ	f℥ 4—f℥ 8	6. —32.
chloroformi	f℥ 1—f℥ 8	4. —32.
ferri et amm. acet.	f℥ 1—f℥ 4	4. —32.
glycyrrhizæ comp.	f℥ 1—f℥ 4	4. —32.
magnes. et asafœt.	f℥ 1—f℥ 4	4. —32.
potassii citr.	f℥ 1/2—f℥ 2	16. —64.
rhei et sodæ	f℥ 1/4—f℥ 1	16. —32.
Morphina, and its salts	1/8 — 1/4	0.004 — 0.03
Morrhuol (derivative of cod-liver oil)	3— 60	0.15 — 4.
Moschus	2— 15	0.1 — 1.
Naphthol	2— 5	0.15 — 0.3
Narceina	1/6 — 1/2	0.01 — 0.3
Nitro-glycerinum (1 % sol.)	gtt. 1 increased.	0.03 increased.
Oleoresina aspidii (filix mas)	15— 60	1.0 — 4.0
capsici	1/2 — 1	0.01 — 0.03
cubebæ	5— 20	0.3 — 1.3
lupulini	2— 5	0.13 — 0.3
Oleum copaibæ	8— 15	0.5 — 1.
erigerontis	5— 15	0.3 — 1.
eucalypti	5— 10	0.3 — 0.6
*phos*phoratum	1— 3	0.06 — 0.2
terebinthinæ	2— 30	0.12 — 2.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Oleum tiglii	gtt. ½— 2	0.01 — 0.06
Opium (14 % morphine)	⅛— 2	0.008 — 0.12
Paraldehyde	20— 60	1.3 — 4.
Pelletierine (Tanret's)	f3 ½—f3 1	15. —32.
Phenacetin	2— 6	0.1 — 0.4
Phosphorus	1/128— 1/60	0.0005— 0.0013
Physostigminæ sulphas	1/128— 1/60	0.0005— 0.0011
Picrotoxinum	1/120— 1/60	0.0005— 0.0011
Pilocarpina, and salts	1/4— ½	0.001 — 0.03
Plumbi acetas	½— 3	0.03 — 0.2
Potassii acetas	15— 60	1. — 4.
bicarbonas	8— 60	0.5 — 4.
bitartras	1— 2	0.06 — 0.13
bromidum	8— 60	0.5 — 4.
chloras	8— 30	0.5 — 2.
cyanidum	1/30— ⅛	0.003 — 0.008
iodidum	2— 30	0.13 — 2.
nitras	2— 15	0.13 — 1.
tartras	3 1—3 8	4. —32.
Pulv. antimonialis	1— 3	0.06 — 2.
Pulv. glycyrrhizæ comp.	30— 60	2. — 4.
ipecac. et opii	5— 15	0.3 — 1.
jalapæ comp.	10— 60	0.6 — 4.
morphinæ comp.	5— 15	0.3 — 1.
rhei comp.	5— 60	0.3 — 4.
Resina copaibæ	2— 10	0.13 — 0.65
euonymi	2— 5	0.13 — 0.3
guaiaci	5— 20	0.3 — 1.3
jalapæ	2— 5	0.13 — 0.3
podophylli	1/12— ½	0.005 — 0.03
scammonii	2— 10	0.13 — 0.65
Resorcin	2— 5	0.1 — 0.3
Rheum	2— 30	0.13 — 2.
Saccharin (substitute for sugar)	¼— 5	0.03 — 0.3
Salicinum	5— 30	0.3 — 2.
Salol	2— 10	0.15 — 0.65
Santonica	8— 60	0.5 — 4.
Santoninum	¼— 5	0.015 — 0.3
Senna	8—180	0.05 —12.
Sodii arsenias	1/24— 1/12	0.001 — 0.006
benzoas	5— 15	0.3 — 1.
boras (in epilepsy)	5— 30	0.3 — 2.
bromidum	5— 30	0.3 — 2.
chloras	2— 5	0.13 — 0.3
hyposulphis	5— 20	0.3 — 1.3
iodidum	2— 30	0.13 — 2.
phosphas	2—120	0.13 — 8.
salicylas	5— 30	0.3 — 2.
sulphas	60—120	4. — 8.
Sparteinæ sulph. (cardiant and diuretic)	1/15— 4	0.004 — 0.25
Spiritus ætheris nitrosi	15—120	1. — 8.
æther. comp.	15—120	1. — 8.
ammoniæ arom.	15— 60	1. — 4.
camphoræ	5— 30	0.3 — 2.
Spiritus chloroformi	15— 60	1. — 4.
Strychnina, and salts	1/60— 1/12	0.001 — 0.005
Sulphonal (best in hot mint-water)	5— 20	0.3 — 1.3
Sulphur	3 ½—3 4	2. —16.
Syr. ferri bromidi	5— 60	0.03 — 4.
ferri iodidi	5— 30	0.03 — 2.
scillæ	30— 60	2. — 4.
scillæ comp.	5— 30	0.03 — 2.
senegæ	f3 1—f3 2	4. — 8.

Remedies.	Grains or Minims.	Grams or Cubic Centimeters.
Syr. sennæ	f℥ 1—f℥ 8	4. — 32.
Terebene	5— 15	0.3 — 1.
Terpin hydrate (tonic expectorant)	2— 5	0.13 — 0.3
Thymol	1— 5	0.06 — 0.3
Tinct. aconiti	½— 5	0.03 — 0.3
aloes	15— 60	1. — 4.
arnicæ rad.	5— 15	0.3 — 1.
asafœtidæ	30— 60	2. — 4.
belladonnæ	2— 15	0.1 — 1.
cannabis ind.	5— 20	0.3 — 1.3
capsici	8— 15	0.5 — 1.
cimicifugæ	30— 60	2. — 4.
cinchonæ comp.	15—120	1. — 8.
colchici [sem.]	5— 20	0.3 — 1.3
conii	5— 30	0.3 — 2.
digitalis	3— 15	0.2 — 1.
ferri chloridi	10— 30	0.6 — 2.
gelsemii	2— 15	0.1 — 1.
guaiaci ammon.	30— 60	2. — 4.
hydrastis	30—120	2. — 8.
hyoscyami	5— 30	0.3 — 2.
ignatiæ	5— 30	0.3 — 2.
iodi comp.	7— 15	0.06 — 1.
kino	15—120	0.1 — 8.
lobeliæ	5— 30	0.3 — 2.
moschi	15— 60	1. — 4.
nucis vomicæ	5— 15	0.3 — 1.
opii	2— 15	0.1 — 1.
opii camph.	5—240	0.3 —16.
physostigmatis	5— 15	0.3 — 1.
stramon.	5— 15	0.3 — 1.
strophanthi (cardiant and diuretic)	2— 10	0.1 — 0.65
valer. ammon.	10—120	0.6 — 8.
veratr. vir.	3— 10	0.2 — 0.6
Trituratio elaterini (10 %)	¼— 1	0.008 — 0.06
Urethane (hypnotic)	5— 30	0.3 — 2.
Vin. antim. {expect. et alt.	1— 8	0.06 — 0.5
Vin. antim. {emet.	30— 75	2. — 5.
colch. rad. (40 %)	5 – 15	0.3 — 1.
colch. sem. (15 %)	5— 30	0.3 — 2.
ergotæ	f℥ 1—f℥ 3	4. —12.
ferri amar.	30— 60	2. — 4.
ipecac. {expect.	5— 15	0.3 — 1.
ipecac. {emet.	f℥ 2—f℥ 6	8. —24.
opii	5— 15	0.3 — 1.
Zinci acet.	¼— 2	0.03 — 0.13
bromid.	½— 5	0.03 — 0.3
iodid.	½— 3	0.03 — 0.2
oxid.	1— 5	0.06 — 0.3
phosphid.	1/10— ¼	0.006 — 0.01
sulphas (emet.)	15— 30	1. — 2.
valerianas	½— 5	0.03 — 0.3

IMPORTANT POISONS AND THEIR ANTIDOTES.

ACIDS, HYDROCHLORIC, NITRIC, SULPHURIC. See *Mineral Acids.*

ACID, CARBOLIC. Evacuation of stomach; *soluble sulphates*, as the sulphates of magnesium, sodium, or dilute sulphuric acid.

ACID, HYDROCYANIC. *Ammonia* by inhalation and subcutaneously; alcohol and atropine hypodermically; artificial respiration.

ACID, OXALIC. *Lime salts* (whitewash, chalk, etc.); calcii carbonas præcipitatus; syrupus calcis.

ACONITE. Evacuation of stomach; recumbent position and perfect quiet; diffusible stimulants (*ammonia, alcohol*); artificial respiration if necessary.

ÆTHER. *Artificial respiration;* faradization of respiratory muscles; *atropine* and strychnine subcutaneously.

ALCOHOL. Evacuation of stomach; *aqua ammoniæ;* heat.

ALKALIES, CAUSTIC POTASSA, AND SODA. Weak acids, as *acetic* (vinegar), *citric* (lemon-juice); later demulcent drinks.

ALKALOIDS. *Tannic acid; iodide of potassium.*

AMMONIA. Weak acids; demulcents.

ANTIMONII ET POTASSII TARTRAS. Tannic acid; morphia; free stimulation.

ARSENIC. Thorough evacuation of stomach; *ferri oxidum hydratum*, freshly prepared and frequently administered; *ferri oxidum hydratum* cum *magnesia; ferrum dialysatum;* stimulants.

ATROPINE. Evacuation of stomach; respiratory and circulatory stimulants; *morphine;* physostigma.

BELLADONNA. See *Atropine.*

CANTHARIDES. Opiates; demulcents in large quantities (water, flaxseed tea, etc.); *Avoid oils;* alkaline diuretics.

CHLORAL. As for *Opium*, q. v., but avoiding forced exertion; cardiac stimulants; heat.

CHLOROFORM. *Inversion of patient*, head downward; cardiac stimulants, *alcohol, ammonia*, and strophanthus hypodermically; amyl nitrite; artificial respiration.

COLCHICUM. *Opium;* stimulants; demulcent drinks in later stages.

CONIUM. Cardiac and respiratory stimulants; artificial respiration; external warmth and measures against shock in general.

COPPER SULPHATE. Albumin; sodii bicarb.

CORROSIVE SUBLIMATE. Albumin; milk; emetics.

CROTON OIL. *Opium;* astringents; demulcents.

DIGITALIS. Quiet in recumbent position; diffusible stimulants, as *ammonia* and *alcohol.*

GELSEMIUM. Alcohol; ammonia.

GAS, COAL OR ILLUMINATING. Oxygen inhalations; stimulants.

HYOSCYAMUS. See *Atropine.*

IGNATIA. See *Strychnine.*

IODINE. *Starch;* demulcents.

IODOFORM. Stimulants as indicated.

LOBELIA. *Tannic acid;* stimulants; opiates.

MINERAL ACIDS. Calcium and magnesium salts (chalk, aqua calcis, magnesia); alkaline carbonates (soap); water and demulcent drinks.

MUSCARIN (POISON MUSHROOMS). *Atropine;* emetics if necessary.

NUX VOMICA. See *Strychnine.*

NITRATE OF SILVER. Common salt (sodium chloride).

OPIUM AND ITS ALKALOIDS. *Evacuation of stomach* by stomach-pump or emetics—by the latter preferably *mustard, cupri sulphas,* or *zinci sulphas;* tannic acid; strychnine; *atropine* tentatively, guided by respiratory effects; *caffeine; black coffee;* various methods of respiratory stimulation; oxygen inhalations; cardiac stimulants.

OLEUM AMYGDALÆ AMARÆ. See *Hydrocyanic Acid.*

PHYSOSTIGMA. Atropine; heat; artificial respiration.

PHOSPHORUS. *Sulphate of copper* as emetic and antidote; *old French oil of turpentine.*

POTASSII CHLORAS AND POTASSII NITRAS. Emetics; cathartics; opium; demulcents.

POTASSA, CAUSTIC. See *Alkalies.*

PRUSSIC ACID. See *Hydrocyanic Acid.*

POTASSII CYANIDUM. See *Hydrocyanic Acid.*

STRAMONIUM. See *Atropine.*

STRYCHNINE. *Chloroform* or *æther,* if necessary to check convulsions; *chloral; bromides.*

SODA, CAUSTIC. See *Alkalies.*

TARTAR EMETIC. See *Antimonii et Potassii Tartras.*

VERATRUM VIRIDE. Emetics if drug have not been self-emetic; recumbent posture and enforced quiet; heat; diffusible stimulants subcutaneously and per rectum.

ZINC, CHLORIDE OR SULPHATE. Albumin; sodium bicarbonate.

INCOMPATIBILITIES.

DRUGS may be *physiologically* or *chemically* incompatible with each other. Physiological incompatibility will be understood only by a thorough knowledge of their physiological effects, chemical incompatibility by strict attention to chemical principles.

When possible make use of the greatest simplicity in prescribing, avoiding multiplicity of drugs in the same prescription. Scientific interest will thus be subserved, a clearer insight into the effects of individual drugs will be possible, and at the same time all likelihood of the ingredients neutralizing each other or forming unpleasant or dangerous compounds avoided.

Remember the chemical principle that soluble salts brought together in the same solution generally, if possible, exchange radicals, with a resultant insoluble compound or precipitate. Hence such combinations are to be avoided; also, that the stronger mineral acids decompose salts of the weaker mineral and vegetable acids, and form ethers with alcoholic preparations. These general statements simply serve to illustrate the bearing of chemistry on the subject of incompatibles. A complete list of incompatible combinations would be inappropriate in a work of this kind. Following are a few general statements, involving the most important ones:

Alkalies are incompatible with acid solutions, alkaloids, and the soluble non-alkaline metallic salts.

Alkaloids in general with tannic acid, alkalies, and chlorinous compounds.

Stronger mineral acids with alkalies and salts of relatively weak acids (carbonic, *hydrobromic,* hydriodic, acetic, citric, etc.).

Arsenic with tannic acid, salts of iron (especially hydrate), and lime and magnesia. In fact, as a matter of course, *all drugs* with their *antidotes*.

Carbonates with stronger acids and acid salts.

Chlorides with salts of silver and lead, and with alkalies.

Corrosive Sublimate with almost everything: it is best given alone in *simple* syrup, even the compound syrup of sarsaparilla being said to slightly decompose it; it is, however, often administered in combination with potassium iodide, which it decomposes, with the formation of an efficient double salt.

Digitalis with iron and preparations containing tannic acid.

Glucosides with *free acids* and substances containing *emulsin*.

Iodine and *Iodides* with alkaloids and the ordinary soluble metallic salts. Iodine and potassium iodide are compatible, as in Lugol's solution.

Iron salts with tannic acid and astringents.

Mucilages with acids, iron salts, and alcohol.

Syrup of Squill contains acetic acid, and is incompatible with the carbonate of ammonium, but not with the chloride.

Sweet Spirit of Nitre with sulphate of iron, tincture of guaiac, and carbonates.

Tannic and *Gallic acids* and the vegetable astringents with alkaloids and salts of iron and lead. Vegetable infusions in general with metallic salts. Tannic acid precipitates albumin and gelatin.

Nitrate of Silver and the *acetate* and *subacetate of lead* are best prescribed alone. The first may be administered with opium and extract of hyoscyamus. The lead salts are much used with opium in "lead-and-opium wash," the insoluble resultant being therapeutically efficient.

Water with tinctures and other alcoholic preparations containing *resin* (as spirit of camphor): the resin is precipitated. When such combinations are necessary, add acacia or other emulsifying agent.

Powerful oxidizing agents with *easily oxidizable* substances: combustion, and even explosion, may occur. Among the oxidizing agents in general medicinal use may be mentioned potassium chlorate, potassium permanganate, chromic, nitric, and nitro-hydrochloric acids. Especially combustible are glycerin, sugar, alcohol, fats, sulphur, and phosphorus.

CLASSIFICATION OF DRUGS

ACCORDING TO THEIR ACTION.

ANTISPASMODICS. Camphor, spiritus ætheris compositus, valerian, asafœtida, moschus, succinum, humulus.

ANÆSTHETICS. Æther, chloroform, nitrogen monoxide, ethylene bichloride, ethyl bromide.

LOCAL ANÆSTHETIC. Cocaine.

HYPNOTICS OR SOMNIFACIENTS. Opium, cannabis Indica, cannabis Americana, chloral, chloralamid, potassium bromide, sodium bromide, lithium bromide, hydrobromic acid, sulphonal, amylene hydrate, paraldehyde, urethane.

BELLADONNA GROUP. Belladonna, stramonium, hyoscyamus, duboisia.

SPINANTS.—*Excito-motors.* Nux vomica, ignatia, cocculus indicus [ergot, digitalis].—*Depresso-motors.* Physostigma, curare, conium, gelsemium, lobelia, tabacum.

AFFECTING CIRCULATORY SYSTEM.—*Cardiants.* Ammonia, alcohol, digitalis, strophanthus, convallaria, sparteine, adonidine, caffeine.—*Nitrite Group.* Amyl nitrite, nitro-glycerin, potassium nitrite, sodium nitrite.—*Cardiac Depressants.* Antimony, veratrum viride, veratrine, aconite, pulsatilla, arnica, staphisagria, hydrocyanic

acid, potassium cyanide, bitter oil of almonds, vegetable acids—acetic, citric, tartaric.

ASTRINGENTS.—*Vegetable Astringents.* Tannic acid, gallic acid, galls, krameria, catechu, kino, hæmatoxylon, hamamelis, quercus alba, rosa gallica, rubus, castanea, rhus glabra, etc.—*Mineral Astringents.* Silver, copper, zinc, lead, alum.

TONICS.—Iron and its salts, manganese, sulphuric acid, hydrochloric acid, nitric acid, nitro-muriatic acid, lactic acid, phosphorus.

ALTERATIVES. Arsenious acid, mercury, iodine and the iodides, iodoform, iodol, cod-liver oil, phosphoric acid, hypophosphites, sarsaparilla, guaiac, mezereum, sassafras, taraxacum, ichthyol, colchicum.

ANTIPERIODICS. Cinchona and its alkaloids, eucalyptus, Warburg's tincture.

ANTIPYRETICS. Salicylic acid and the salicylates, salicin, oil of gaultheria, salol, betol, carbolic acid, creosote, kreolin, thymol, resorcin, benzoin and benzoic acid, antipyrin, antifebrin, phenacetin, thallin, kairin, naphthaline.

STOMACHIC BITTERS.—*Simple.* Quassia, gentian, calumba, chirata, hydrastis.—*Aromatics.* Serpentaria, cascarilla, anthemis, eupatorium, cimicifuga, absinthe.—*Astringents.* Cornus, prunus Virginiana.

DIURETICS. Squill, scoparius, apocynum, triticum, vascular diuretics (see *Cardiants*), potassium compounds.

BLENNORRHETICS. Buchu, pareira, matico, uva ursi, juniper, chimaphila, oil of erigeron, oil of turpentine, copaiba, cubeb.

CATHARTICS.—*Laxatives.* Tamarind, manna, cassia fistula, castor oil, olive oil, magnesia.—*Salines.* Magnesium sulphate, solution of magnesium citrate, Rochelle salt, phosphate of soda, sulphate of potassa, bitartrate of potassium.—*Astringent Resin-bearing Purgatives.* Rhubarb, senna, aloe, cascara sagrada, frangula, juglans, leptandra.—*Drastics.* Jalap, podophyllum, chelidonium, iris, euonymus, scammony, colocynth, camboge, elaterium, croton oil.—*Mercurials.* Calomel, massa hydrargyri.

ANTHELMINTICS. Santonica, spigelia, chenopodium, azedarach, aspidium, granatum, kamala, brayera, pumpkin, oil of turpentine, ailanthus.

EMETICS.—*A.* Local: *Mineral.* Copper sulphate, zinc sulphate, alum, turpeth mineral. —*Vegetable.* Mustard.—*B.* Systemic: Ipecac, apomorphine, sanguinaria, tartar emetic.

DIAPHORETICS. Pilocarpus, liquor ammonii acetatis, sweet spirit of nitre, antimony, ipecac, refrigerant diaphoretics.

EXPECTORANTS. Lobelia, antimony, ipecac, grindelia, pulsatilla, senega, ammonium chloride, garlic, balsam of Peru, balsam of Tolu, pix liquida, terebene, terpin hydrate.

EMMENAGOGUES.—*Tonic Emmenagogues.* Iron, manganese.—*Purgative Emmenagogues.* Aloe.—*Stimulating Emmenagogues.* Savine, rue, parsley, tansy, water-pepper.

OXYTOCICS. Ergot, cotton-root bark, ustilago, cimicifuga.

IRRITANTS.—(1) *Rubefacients.* Mustard, capsicum, Burgundy pitch, Canada pitch, oil of turpentine.—(2) *Vesicants.* Cantharides, stronger ammonia.—(3) *Escharotics.* Nitrate of silver, caustic potassa, caustic soda, arsenious acid, zinc chloride, bromine, chromic acid, solution of nitrate of mercury, nitric acid.—(4) *Suppurants.* Croton oil, ointment of antimony.—(5) *Mild Irritants.* Green soap, chrysarobin.

DEMULCENTS. Water, acacia, tragacanth, cetraria, chondrus, ulmus, licorice, lycopodium, starch, althæa, cydonium, sassafras medulla.

EMOLLIENTS. Lanolin, glycerin, petrolatum, lard, oil of theobroma, cetaceum, white and yellow wax.

PROTECTIVES. Pyroxylum, collodion, gutta percha, etc.

ANTACIDS. Sodium and its salts, lime and lime salts.

ANTISEPTICS. Lime, ozone, peroxide of hydrogen, permanganate of potassium, sulphurous acid, corrosive sublimate, boric acid, borax, chlorine-water, chlorinated lime, solution of chlorinated lime.

AROMATICS. Cinnamon, cloves, nutmeg, allspice, cardamom, ginger, pepper, capsicum.

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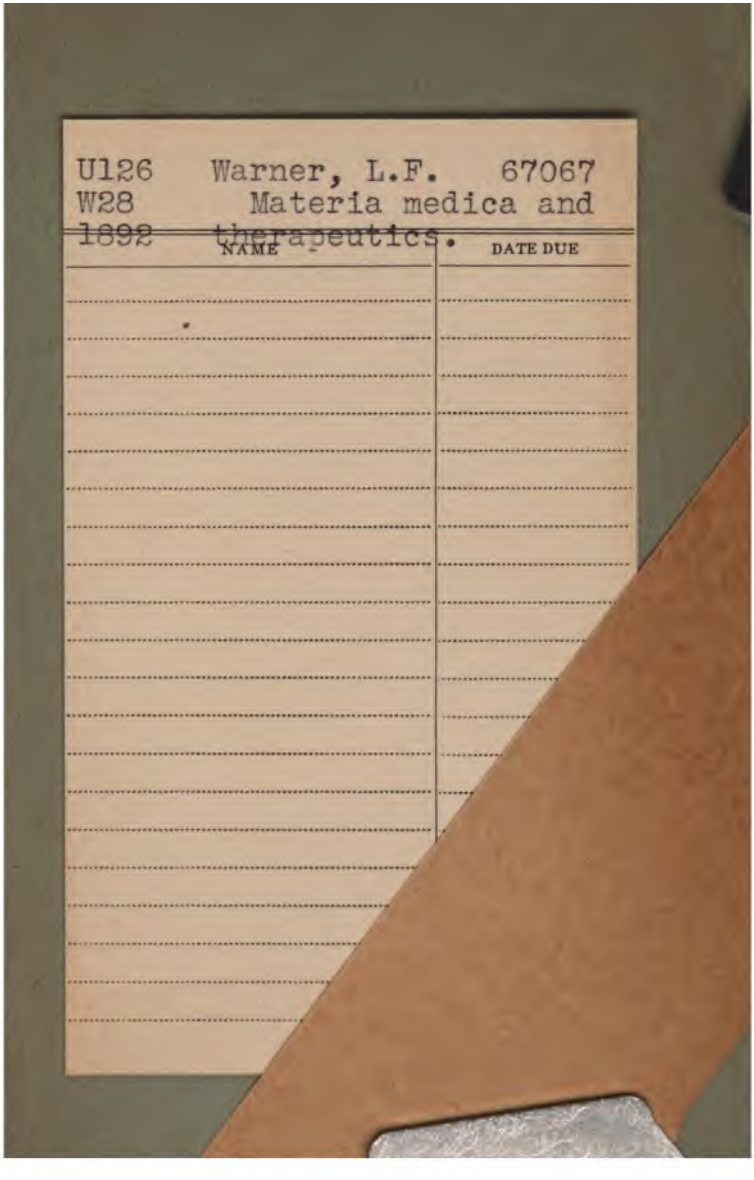
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